

HP Professional

AN INDEPENDENT PUBLICATION FOR USERS OF HP COMPUTERS ■ VOL.4 ■ NO.5 ■ \$4.00

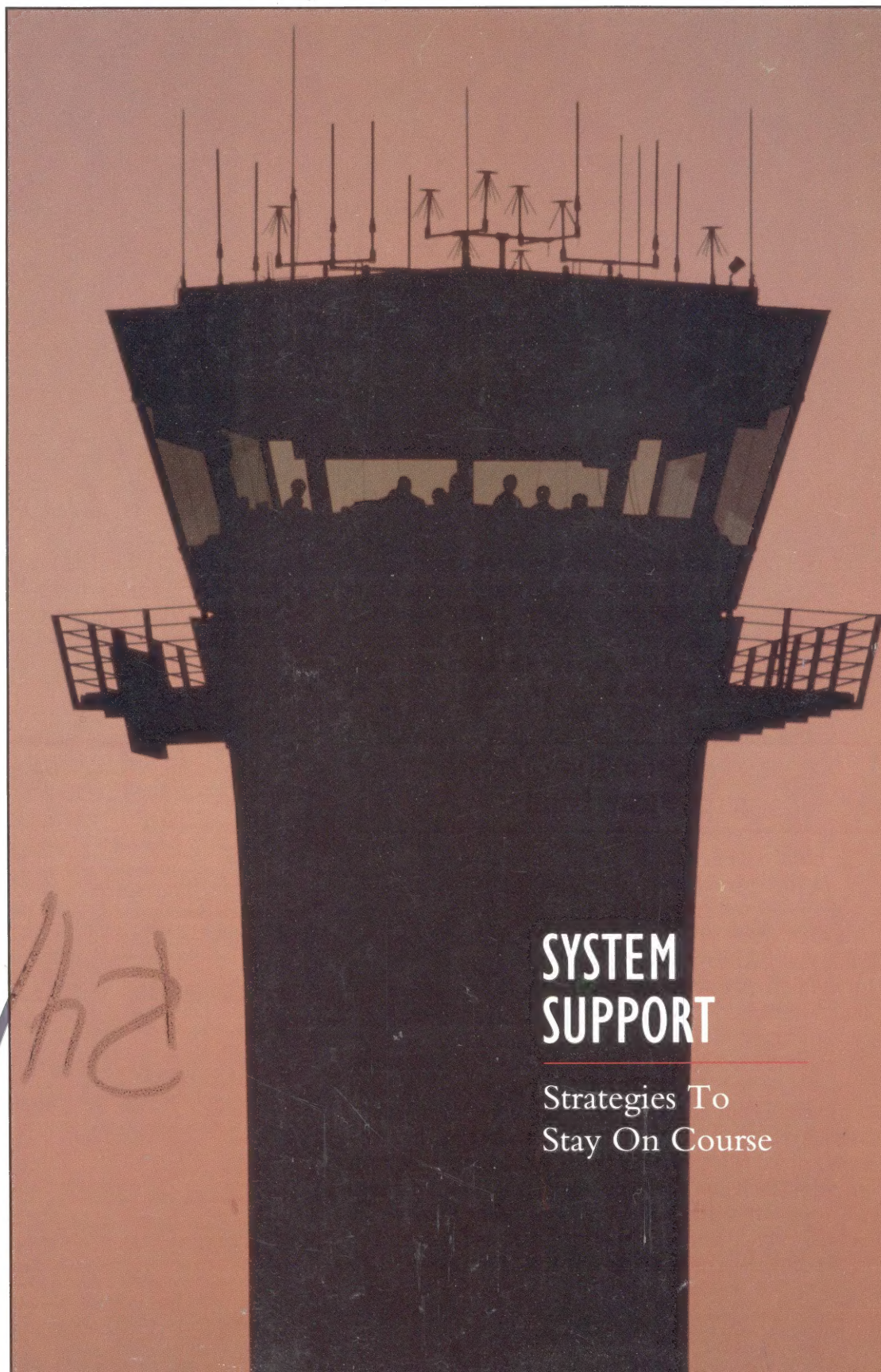
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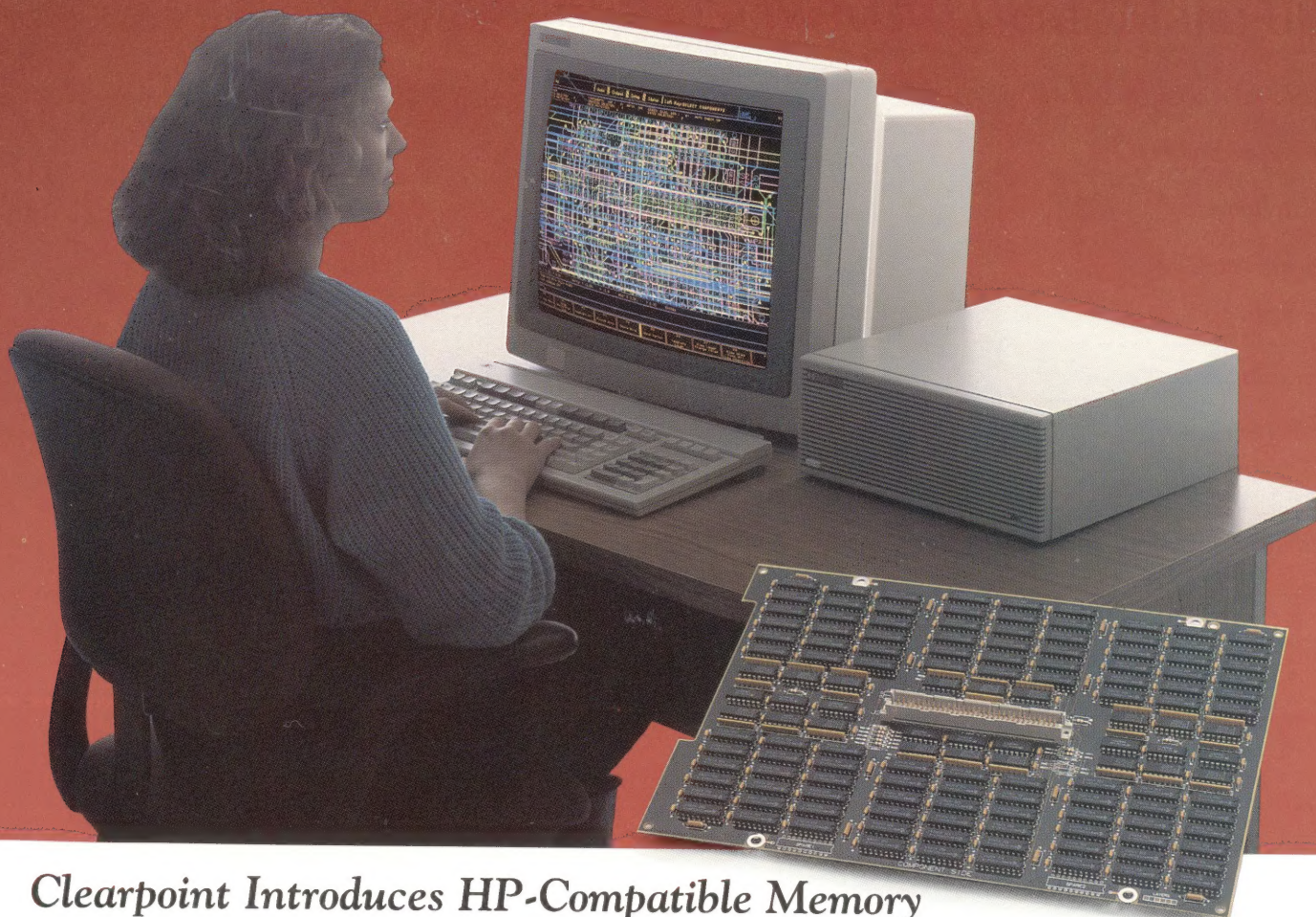
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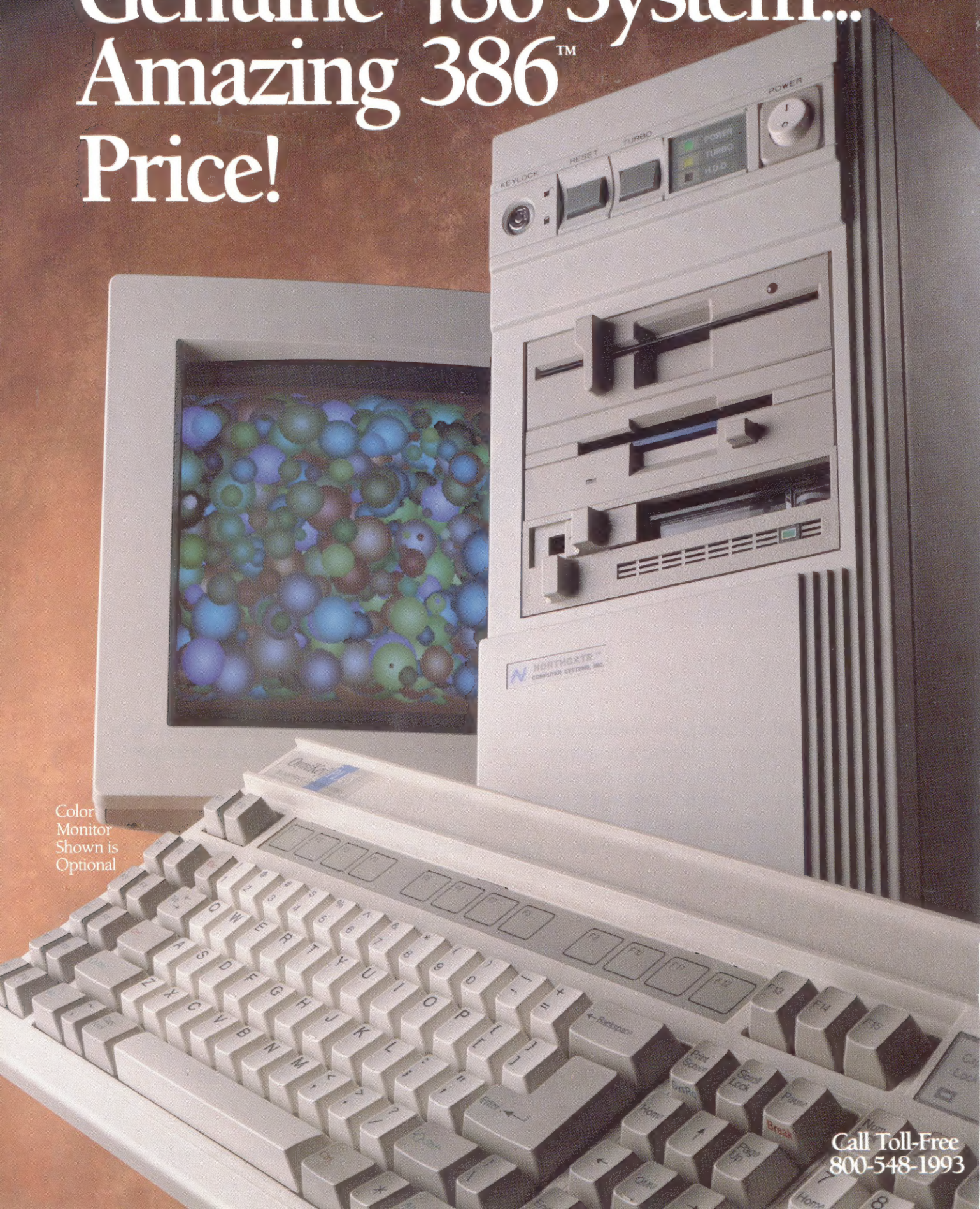
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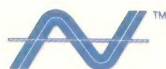
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CIRCLE 246 ON READER CARD

"We hear you!"

Full Steam Ahead

HP has recently set its course for the '90s and it's full steam ahead to NewWave Computingland.

Citing its commitment to open systems and standards, HP in March announced NewWave Computing, a standards-based computer strategy and underlying computer architecture that the company hopes will strengthen its lead in the worldwide movement to open, cooperative computing systems.

"In the '90s, computing will become a pervasive technology, more noticeable by its absence than its presence," explained Joel S. Birnbaum, vice president and general manager of HP's Information Architecture Group. "When technology is pervasive, users concentrate on what it does, not on how or where the service is performed."

There you have it in a nutshell: standards, open systems, object orientation, cooperative processing, and of course, networking — everything you've always wanted from a computer vendor.

"What other vendors are just beginning to talk about is, in fact, the basis of NewWave Computing now," commented Dean O. Morton, HP's executive vice president and CEO. He added that NewWave Computing "formalizes our approach to cooperative computing and provides the blueprint for its implementation in the mid-1990s."

The power behind the NewWave Computing motor comes from NewWave's user environment technology and the Apollo-spawned Network Computing System (NCS). Both systems are the cornerstones of the NewWave Computing System architecture. Both developments are based upon a common "object-oriented philosophy," according to Birnbaum, "and their combination produces a unique integrated technology which we think gives us an important edge in distributed systems."

Now, HP's job in the next few years will be to extend the architecture across all of its systems. The strategy will rely on three key product groupings or "pillars."

- industry-leading desktop computing solutions, including PCs, UNIX system-based workstations and peripherals.
- industry-standard, multivendor networking products.
- a scalable, RISC-based architecture and family of processors.

Birnbaum says that NewWave Computing will make it possible for users to begin to treat computing the way they do electric power. "They won't have to think about how it is delivered — they'll just plug in their appliance and concentrate on their tasks," he said.

HP points out that NewWave Computing will enable customers to select the best available computer products from HP or other vendors and link them into cooperative networks that make information much easier to acquire, share, use and manage.

Industry watchers and analysts have praised HP for its leadership and commitment to open standards and cooperative computing. And, the NewWave user environment is gaining strength as an industry standard as other vendors (AT&T, Data General and NCR) have licensed it.

Will NewWave Computing create a ripple effect throughout the industry? Only time will tell. But for now, HP's course is plotted, and the wind is at its back.

Tom Halligan



INDUSTRY WATCH

Peggy King

portunity to meet with high-level management, development engineers and marketing specialists. The program, initiated in 1985, gave key HP managers the chance to find out first hand their customers' perceptions about HP products.

However, during the past year, the program has expanded both its scope and its focus. Beginning last spring, teams of HP employees paid visits to some of their competitors' customers. In the past, visits focused on customers' perceptions of existing products, but some HP customers were visited by teams that included design engineers eager to hear customers' "wish lists" for future high-end systems.

Katherine Tobin, who manages the Customer Visit Program, refers to these visits as "structured visits" because the HP team always has a specific business issue in mind when it visits the site. Three to five HP employees form a team that visits five or six customers. The team members receive extensive training before the visit.

Unlike focus groups that are usually held in a "neutral" setting, all interviews are held at the customer site. Being at the customer site helps team members experience how HP systems are used in an actual business setting. Unless the customer requests confidentiality, the interview sessions are taped and then discussed when the team members hold debriefing sessions back at HP. The interviews are led either by a professional interviewer from a market research company or by a member of the interview team.

The first series of visits in 1985 was undertaken to determine why customers

thought the Series 68 was less reliable than previous HP 3000 systems.

Other visits have focused on the Micro 3000s and on the Series 900 Precision Architecture Systems. The series conducted in March and April last year had the broader focus of understanding customers' perceptions about Hewlett-Packard as a company.

Working Together

Regardless of the specific business purpose of the visits, the program provides a way for managers and engineers to hear customer needs first hand.

Beginning last year, the program joined forces with a company-wide effort to implement Quality Function Deployment (QFD). Teams that included design engineers for high-end systems in both the Series 900 (MPE XL) and Series 800 (HP-UX) product lines visited customers who use computers from IBM (both AS/400s and 3090s), DEC and Tandem for online transaction processing (OLTP) applications in diverse industries including retail sales, financial services, consulting, health care and travel.

The customer visit teams talked to HP customers and value added resellers as well as to other vendors' customers. The purpose of these visits was to learn what features should be included in a high-end system that HP plans to introduce in 1992, and to evaluate whether there should be a separate high-end system for the OLTP market.

After the visits, the team constructed a House of Quality matrix to show what customers at each company looked for in an OLTP computer.

According to Carol Draper, Customer Visit Program coordinator, this project is the first time HP had used QFD to design a computer.

Previous customer visits have given

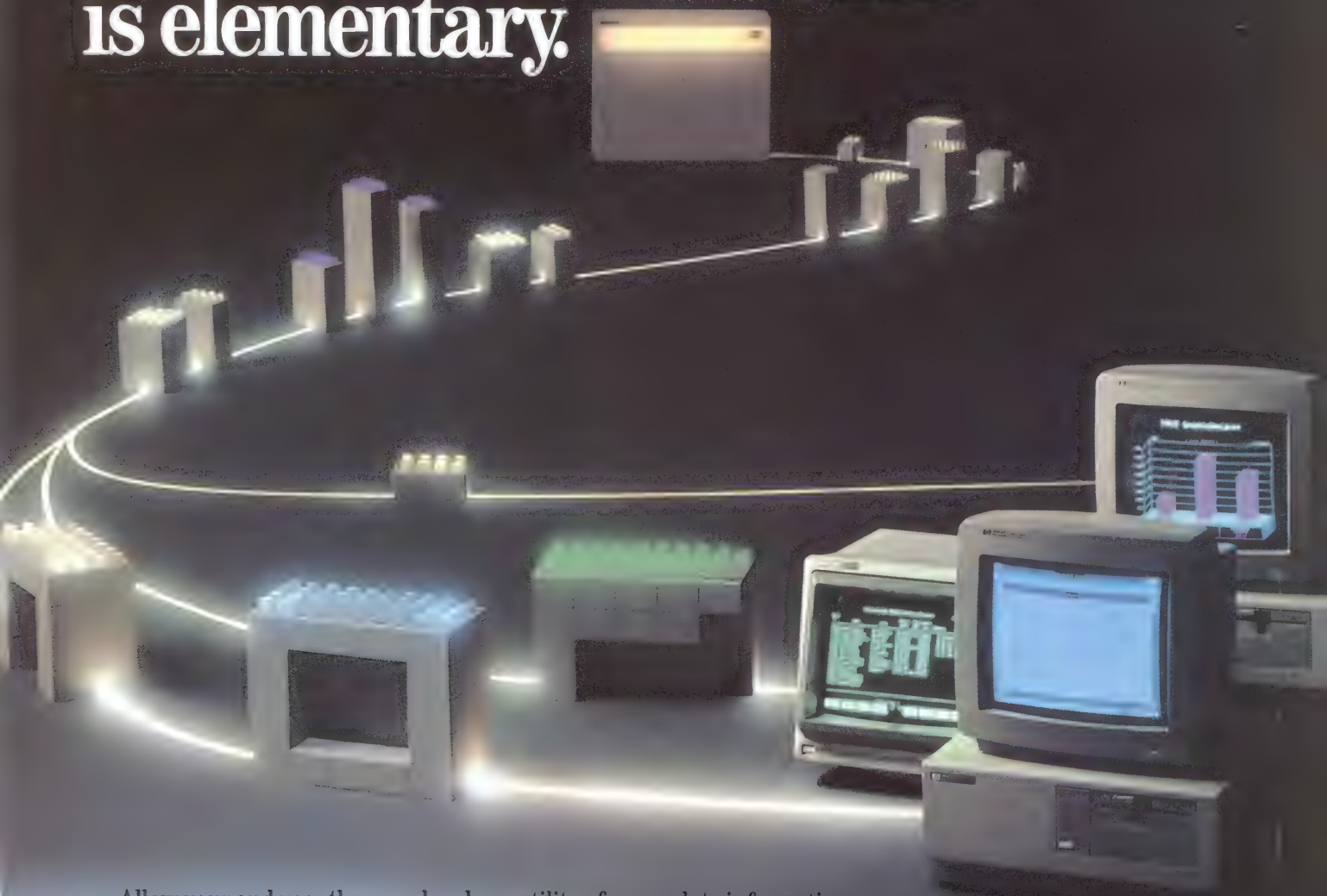
HP employees, especially research and development engineers who are less likely to be acquainted with the type of environment where most HP 3000 systems operate, a chance to learn what features customers expect. For example, recent customer visits made team members more aware of why it's important to have reliable systems. They heard customers say that 99 percent uptime for a system that runs their business is unacceptable because that can mean seven hours a month downtime in an environment where even 20 minutes off the system can have adverse effects.

"There is no good time to take a system down," one customer said. This and similar remarks brought home the message that many customers had worldwide or 20-hour shift operations, so any downtime cuts through someone's working day. Perhaps the feedback from this series of visits was a behind-the-scenes factor in the recent announcement that HP would incorporate Sequoia's fault-tolerant multiprocessor technology in future systems.

Team members learned firsthand about the importance of ease of use when they heard end-users say that they did not want to have to learn programming to use the HP 3000. They learned that many customers need multivendor connectivity solutions that HP does not yet provide. Then they returned to their divisions to present their findings.

Although the team members heard about numerous ways that HP can improve its products and services, the overall message from customers was that they like doing business with HP and remain loyal even when HP is going through "growing pains" with the introduction of new product lines.

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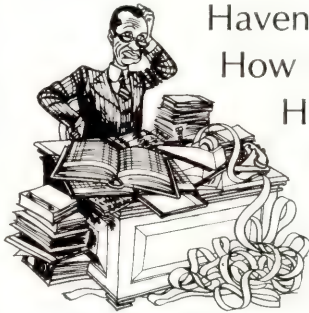
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According to Skip LaFetra, a Quality Engineering manager, who was a team leader in a recent series of visits, "Customers tell us that they want to be in partnership with us. They don't just want a catalog of products but instead look to HP for advice on what products they need to meet their business goals."

While it's reassuring to have the support of current customers, HP won't capture market share just by keeping the installed base satisfied. When visit teams talked to customers, they learned some of the things HP will need to do to attract new customers. Both the competitors' customers and existing customers say that in the future they expect they can use as much processing power as the hardware can provide. When they consider 1995, they want to be ready for the demands of resource-intensive applications such as expert systems, relational databases, and scanned images. Existing customers of the HP-PA Series 900 want to have more performance tools, on a par with those offered on competing systems.

Recently, the term customer visit took on a new dimension at HP's Computer Systems Division (CSY). A group of State Farm employees addressed an audience of 300 HP employees as large CSY customers have done for the past 10 years. As usual, State Farm presented its wish list of what features they hoped to see in the future high-end systems. The unusual part of this visit was that the State Farm got an impromptu invitation to catch a glimpse of the product design process at HP. Every Wednesday, the design team at Systems Technology Division has a status meeting to discuss progress in the design of the high-end system HP plans to introduce in 1992. The State Farm folks came and joined in the discussion. Most likely, product designers learned as much from this unstructured visit as from the carefully planned structured visits.

Regardless of who visits whom, both vendors and customers have much to gain by working together to design future products and improve existing ones.



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MAESTRO Squeezes Every Drop of Throughput From Your Batch Job Processing

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MAESTRO allows you to realize your full production potential because it reacts instantly to a job completion, reply to a prompt, job termination, or any other significant event. This split-second response is impossible for even the most diligent operators, because they're often busy with other things like loading paper. MAESTRO's attention to detail also minimizes costly errors.

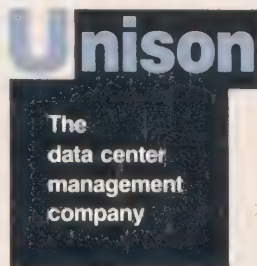
MAESTRO automatically manages a variety of tasks which are usually performed manually, such as integrating user job requests, scheduling production, preparing job streams, and documenting job status. In fact, MAESTRO is

so efficient it gives you the potential to run production completely unattended. Even if you have multiple CPU's.

We could go on and on. About saving computer time. Ease of use. Cutting personnel costs. And much more.

But all it takes is one look at MAESTRO in action. Call us today at (408) 245-3000 for a 30-day demonstration or to find out more.

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HP Announces LaserJet III Printer

Offers Improved Print Quality, Font And Graphics Capabilities

Hewlett-Packard has introduced the HP LaserJet III printer.

The third-generation HP LaserJet III printer offers improved print quality through HP's Resolution Enhancement technology, on-the-fly font scaling and faster graphics printing. U.S. list price is \$2,395, \$300 less than the HP LaserJet Series II printer it replaces. The eight-page-per-minute printer is fully com-

patible with the HP LaserJet Series II printer.

The HP LaserJet III printer produces text and graphics with smoother edges, sharper points and cleaner line intersections. The HP Resolution Enhancement technology adjusts the position and size of dots. These adjustments smooth the stair-step effect inherent in 300 dpi printing, the standard for desktop laser printers.



HP's LaserJet III offers improved print quality through HP's Resolution Enhancement technology.

CD-ROM To Replace Paper And Tape Documentation

HP Program Provides Monthly CD-ROM Updates For Minis And Workstations

Hewlett-Packard has announced that customers can replace paper documentation and updates to operating systems on magnetic tape with CD-ROMs (compact-disc read-only memory).

The HP CD-ROM integration program provides support material related to the operation of HP minicomput-

ers and workstations on CD-ROM. This material includes technical user's manuals, software-status bulletins, application nodes, operating-system software and subsystem software.

CD-ROM is an extension of the technology found in audio-compact discs. The same platter on which the music industry places 70 min-

utes of digital sound also can store the equivalent of hundreds of floppy diskettes.

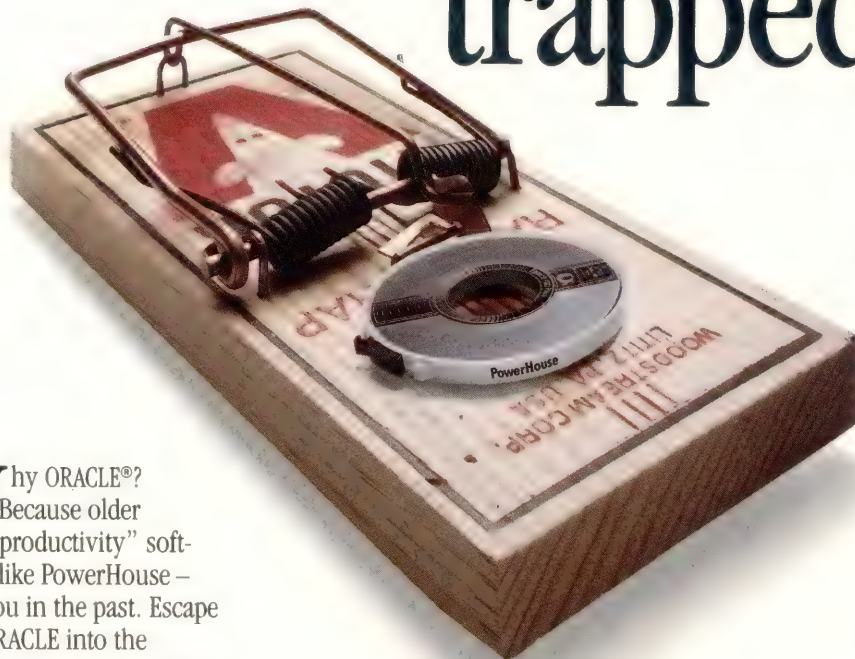
HP CD-ROM integration, which is designed for system managers, system administrators and software engineers, addresses the HP MPE V, MPE XL and HP-UX operating system environments. Documentation on CD-ROM is updated monthly for HP MPE and HP-UX customers. In addition, HP distributes software for the MPE V operating system on CD-ROM.

By placing data on CD-ROM, the customer can in-

stantly locate specific information instead of manually paging through paper documentation. In the case of software distribution on CD-ROM, the user can reduce software installation time by 50 percent.

In the past, HP customers automatically received documentation and software on paper as part of their support contracts. If a customer preferred the information on compact discs, an extra charge was incurred.

Why ORACLE? So you don't get trapped.



Why ORACLE®? Because older "productivity" software — like PowerHouse — traps you in the past. Escape with ORACLE into the computing environment of the 1990s.

Escape the trap of proprietary languages and poorly integrated products. ORACLE products use industry-standard SQL and are fully integrated to give you a complete MIS solution.

Escape the trap of older command-driven interfaces. ORACLE tools feature a modern, customizable user interface with pop-up and pull-down menus, and a powerful screen-painter for faster development and more user-friendly applications.

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transfers. ORACLE fully utilizes your network, yet keeps the network invisible to your users. For example, ORACLE applications running on a PC can transparently access data on your HP 3000.

Escape the trap of waiting for vaporware. ORACLE offers powerful, flexible RELATIONAL DBMS technology today. Like online database modification, ad-hoc query capability and customized views of your data.

Escape all the hardware traps. ORACLE's true

portability gives you complete hardware independence.

With ORACLE, your applications, your data, and your data definitions run on the HP 3000, HP 9000, HP Vectra and over 80 different hardware platforms. And ORACLE will also run on your future hardware platforms.

Why ORACLE? Because you're ready to escape the traps of the 1980s with the technology of the 1990s. Call 1-800-345-DBMS ext. 0966 to register for the next, free ORACLE data management conference near you.

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AL	Birmingham	June 6f
AZ	Phoenix	May 10
	Scottsdale	June 14f
CA	Costa Mesa	May 17cl
		June 19f
	La Jolla	June 12f
	Los Angeles	May 22fp
		June 21ef
	Sacramento	May 17c
	San Diego	May 15p
	San Francisco	June 13fp
	Santa Clara	May 2fp
		June 11ef
CO	Colorado Springs	May 8
	Denver	May 16c
CT	Farmington	June 21f
DC	Washington	May 8*
		June 12*
FL	Fort Lauderdale	June 13c
	Indianapolis	May 22*
	Tampa	June 14c
GA	Atlanta	May 24* June 7c
IL	Chicago	June 6fp
		June 13f June 26*
IN	Indianapolis	June 19f
KS	Wichita	May 3
LA	New Orleans	May 11f
		June 15c
MA	Boston	June 12f
	Worcester	June 19f
MI	Grand Rapids	June 13f
	Troy	June 14f
MN	Minneapolis	May 1f
MO	Kansas City	June 12f
	St. Louis	May 8fp
NE	Omaha	May 9 June 28*
NH	Merrimack	May 3f
NJ	Iselin	May 8f
		May 29c June 12f
NY	Buffalo	May 3p
	Melville	June 13p
	New York	May 9f June 6f
	Syracuse	June 14cl
OH	Cincinnati	May 3f
	Cleveland	May 1f
	Columbus	June 6f
OR	Portland	May 22f
PA	Philadelphia	May 2f
	Pittsburgh	June 5f
TN	Nashville	June 12c
TX	Austin	June 8c
	Dallas	May 10cfp June 12cf
	Houston	June 14cf
	San Antonio	June 15c
UT	Salt Lake City	June 7u
WA	Seattle	May 15f June 12c
WI	Milwaukee	June 28f

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London	May 17c
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Use the following key for identifying the special afternoon sessions that are offered with the seminar dates above:

- c CASE/Application Tools
- f Oracle Financials
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- * These seminars are held for the Federal Government only.
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HP/PROF

HP CASEdge Converges Across All Workstation Platforms

SoftBench Encapsulator Ported To Apollo Workstations

HP has announced the convergence of its HP CASEdge program for software engineers across all of its workstation platforms.

The first announcement within the convergence program is the port of HP SoftBench and HP Encapsulator to Apollo workstations.

Based upon a tool-integration platform, HP SoftBench includes a set of integrated tools for program development, test and maintenance. HP SoftBench on Apollo workstations will incorporate distributed debugging environment (DDE), the Domain/OS debugger, as the de-

bugger for the environment.

HP Encapsulator allows users to extend and customize the HP SoftBench environment. The environment may be extended by adding tools without source-code modification and customized by establishing communication links between tools to automate development processes.

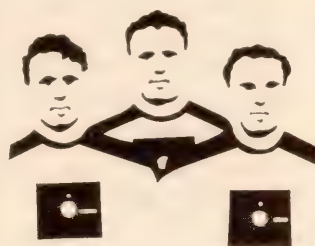
The second announcement within this program is the ability to remotely access DSEE from HP 9000 Series 300 or 800 workstations and the encapsulation of DSEE under HP SoftBench across platforms.

HP Introduces Open Dialogue Version 2.0

Added To HP Team Computing Program

Hewlett-Packard has released Version 2.0 of its Open Dialogue object-oriented interface-management system. It allows software developers to create and maintain graphical interfaces for standards-based applications across a range of hardware platforms.

Open Dialogue Version 2.0 from HP's Apollo Systems Division has been added to the HP Team Computing product family, a suite of advanced networking products that help customers configure fully integrated



multivendor computing environments.

Version 2.0 offers several enhancements, including support for OSF/Motif-style interfaces, new implementations for RISC-based workstations with Apollo's RISC and Sun's SPARC architecture and ADA language support on Domain/OS.

Unison Opens Two Offices

Provide Sales And Customer Support To European, And East Coast Customers

Unison Software Inc. has announced the opening of its German subsidiary, Unison Software Deutschland GmbH. The office, located in Frankfurt, will offer sales and customer support to Germany, Switzerland and Austria. This is Unison's second European office, the other is located in Harpenden, England.

Unison also opened an office in Parsippany, NJ and will provide sales support for the HP 3000 user community on the East Coast.

Contact Unison Software, 675 Almanor Ave., Sunnyvale, CA 94086; (408) 245-3000.

Circle 365 on reader card

HP Introduces Rewritable Optical Disk Drive For Apollo Series 2500 Workstations

First Rewritable Optical-Storage Product Developed For Apollo Workstations

Hewlett-Packard has announced the availability of the first rewritable optical-storage product developed by HP for the Apollo workstation family.

The HP Series 6300 Model 650/A disk drive provides Apollo Series 2500 personal workstations with a cost-effective solution for accessing large amounts of data. The drive also is available for HP 9000 Series 300 workstations.

Because the Model 650/A is lower in price than hard disks of equivalent capacity and provides faster access times than tape, it complements the Series 2500, the industry's only \$4,000 (U.S. list) workstation.

The Model 650/A is part of a family of HP rewritable optical products developed

for direct-access secondary storage. This disk drive is designed for users needing random access to large amounts of data that can be modified frequently. The Apollo Series 2500 workstation typically is used for electronic publishing and computer-aided software engineering (CASE) applications.

Electronic-publishing users can use this online storage system to call up previously created files to avoid the time and cost involved in the reproduction of complex drawings and text. Software developers benefit from access to reusable code and also can monitor their revision controls by archiving each version of their software on this optical disk.

Massive Storage

2.5GBytes Mass Storage in a single, compact cartridge about the size of a deck of cards for HP 3000, 1000, and 9000 computers



ECHO 4920

High Capacity 8mm Cartridge Tape Backup

- ▼ High-Capacity, Cost-Effective Tape Backup
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- ▼ High Performance – 11MB per minute transfer rate
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CIRCLE 106 ON READER CARD

Vital Soft Signs Agreement With Brant Technologies

*Brant To Distribute Visimage,
A Report Writer For HP 3000 And PC*

Vital Soft Inc. (Mountain View, CA) has appointed Brant Technologies (Mississauga, Ontario) the Canadian distributor of Visimage.

Visimage is an report writer that gives users efficient access to corporate data. Visimage PC, a companion product, allows users to take advantage of PC capabilities while accessing HP 3000 data to produce reports or download to Lotus and other PC applications. With Visimage PC, data remains centralized on the HP where it's secure and easily maintained, while user offload the main CPU by designing reports on the PC.

Contact Brant Technologies, 2605 Skymark Ave., Mississauga, Ontario, Canada L5W 4L5; (416) 238-9790.

Circle 367 on reader card

Verity Ports TOPIC To HP 9000

*Document Retrieval System Designed
For Distributed Network Computing*

Verity Inc., developer of the TOPIC document retrieval system, has announced a marketing agreement with HP to become a member of HP's software supplier program. The company also announced the availability of TOPIC for HP 9000 Series 800 workstations and multiuser systems and Series 600 servers.

TOPIC is designed for distributed network computing environments. It's based on concept retrieval technology, a method of searching across text and image data. The TOPIC architecture supports retrievals across large collections of documents stored in multiple formats on diverse

computing platforms.

TOPIC consists of the TOPIC Retrieval Client and the TOPIC Database Builder. TOPIC capabilities include support for real-time information sources; HyperLink connections to images, annotations and documents; Topic-By-Example query guildler; and the optional TOPIC SQL-Bridge interface to SQL-based relational databases such as ORACLE, SYBASE, Ingres and Informix.

Contact Verity Inc., 1550 Plymouth, Mountain View, CA 94043-1230; (415) 960-7600.

Circle 375 on reader card

Cognos Adapts PowerHouse To ALLBASE/SQL

QuizPLUS And PowerPlay Also Released

Cognos Inc. has announced it will adapt its PowerHouse 4GL to work with HP's ALLBASE/SQL relational database.

By extending the PowerHouse application development environment to include HP's relational database solution, users have an open environment where they can plan long-term corporation development strategy without losing existing applications and valuable historical data.

In addition, Cognos announced it will bring PowerHouse StarBase, an advanced distributed SQL relational database, to HP-UX and MPE XL.

Cognos also has begun shipping two new end-user tools to HP customers.

QuizPLUS provides information workers with a menu-driven tool to build reports for ad-hoc data access and generates standard QUIZ

code that is fully compatible with PowerHouse.

PowerPlay lets management decision makers access and analyze summarized corporate information. It employs a graphics-oriented format that facilitates the manipulation, presentation and comprehension of data and permits "drilling down" into the detailed data that underpins the summary information. The standalone version for the Vectra is currently available; a client-server version will be made available for the MPE XL platform.

Additionally, HP recently announced its purchase of 250 copies of PowerPlay as part of the renewal of its corporate agreement with Cognos.

Contact Cognos Inc., 3755 Riverside Dr., P.O. Box 9707, Ottawa, ON K1G 3N3; (508) 535-7350.

Circle 374 on reader card

Abend Offers Service To Oracle Users

*Hot Line Provides Answers
Without Consultant Cost*

Abend Associates has announced a service for Oracle users. The Hot Line for Oracle provides rapid, reliable responses to Oracle application questions without having to bring in consultants. Questions may be received by fax or phone and per call

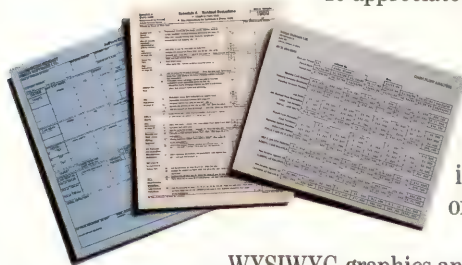


monthly rates are available.

Contact Abend Associates Inc., 265 Winn St., Burlington, MA 01803; (617) 273-5383.

Circle 366 on reader card

WE'D LIKE TO SUGGEST A FEW NEW CRITERIA FOR CHOOSING FORMS SOFTWARE.



To appreciate the benefits of JetForm™ software, we invite you to first examine the subject of business forms themselves. And why every business has so many.

It's because forms are the proven way to gather information. Communicate it. Store it, and process it. Which is precisely the point of view from which JetForm was developed.

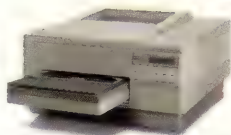
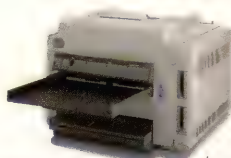
Naturally, JetForm gives you complete

WYSIWYG graphics and font control, using the industry standard Microsoft® Windows interface.

But we also give you something else. And that's a set of capabilities that turns forms software from a handy way to replace pre-printed forms into a powerful way to run a business.

Which is why you'll find JetForm prints faster on the laser printers that businesses use most.

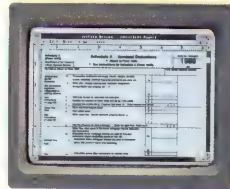
And connects more effectively to networks. So both forms and the information they contain can be better shared and communicated - across departments, or entire organizations. And not just with IBM® PCs, but with HP®3000s, HP9000s, DEC® VAXs™ and UNIX® machines.



Combined with our optional JetForm-Merge and JetForm-Server software, JetForm makes it possible to completely automate and streamline the entire information management process. From design and forms completion, to printing and integration with your existing dBASE® files.

As years pass, other software makers may discover the true purpose of business forms, and upgrade their products to the capabilities of JetForm. But JetForm has them today. And a new business day starts tomorrow.

Call 800-267-9976 for complete information on the full family of JetForm forms software.



THEY'RE MORE THAN JUST FORMS. THEY'RE YOUR BUSINESS.

SPEED

Find out how fast it prints on HP LaserJet® printers, and the new IBM LaserPrinter 4019. You'll find JetForm is three times faster than others.

RANGE

How well does it work in a network? Sending forms around the office is one thing. Managing information throughout your organization, across multiple platforms, is quite another.

CAPACITY

Will it handle all your forms needs? Including complex policies and contracts, as well as bar code labels? Will it handle them in the volume you'll need as your forms applications grow?

CONTROL

Just because it "links" to your database doesn't mean it takes full advantage of database links. JetForm verifies data, performs calculations, and fully reads and writes dBASE files.

DESIGN

Make sure you get a full set of flexible, easy to use, WYSIWYG design tools tailored to forms design. After all, this isn't desktop publishing. It's information management.

HP Centralizes Consulting Services

New ConsultLine Services Focus On Requirements Analysis At Customer Sites

ConsultLine is the newest product offering from HP's Worldwide Customer Support Organization (WSCo), but HP has offered consulting services on an ad hoc basis for many years.

Until now, each HP division or operation that offered consulting would negotiate its own contracts, and frequently there would be multiple contracts for a single project.

The year before ConsultLine became available, HP restructured the consulting services offered by about 3000 consulting professionals within HP. A centralized consulting business that's delivered through local service offices worldwide makes it easier for customers to purchase consulting services and to have all components of the consulting covered under one contract.

To strengthen its ability to deliver consulting services, HP invested more than \$1 million in the restructuring of these services during the past year. Some of the money went to retraining systems engineers in the Applications Engineering Organization (AEO), some went to hiring other consultants to work for HP and a portion of it went to other consulting firms that HP hired to learn more about setting up ConsultLine.

ConsultLine is focused on attracting new consulting business in the HP's traditional areas of expertise, manufacturing, networking, perform-

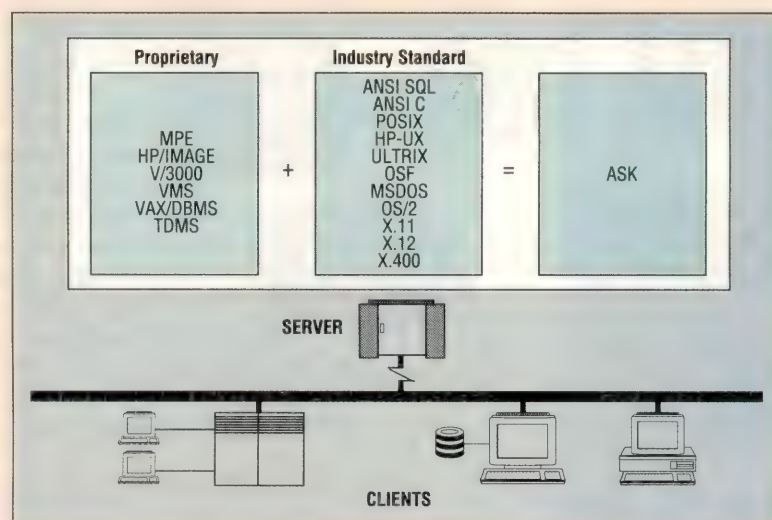
ance analysis for MPE, MPE XL and HP-UX minicomputers and engineering automation. There's also a focus on requirements analysis. HP hopes that many of its ConsultLine customers will con-

tract for a requirements analysis of their information systems. The company's Application Support Division has developed a requirements template to help companies understand their needs before they purchase hardware or commission software projects.

A requirements analysis is conducted in phases. First the consultant meets with the customer's key information systems executives and

then uses various methods including interviews, surveys and focus groups to gather data about the company's requirements.

The consultant then returns to the local HP office to write a report that describes the customer's current environment and recommends changes. Then the consultant returns to the company to present the findings.—Peggy King, West Coast Editor



ASK will support both proprietary and industry standard environments.

ASK Unveils Product Strategy For The 1990s

Includes Information System That Operates Seamlessly Across Multivendor Environment

ASK Computer Systems has unveiled its strategy to develop new information systems for the era of networked computers.

ASK is developing a class of information system that will operate seamlessly across a multivendor environment. Users on the network will be able to simultaneously access information from different types of computers and databases located at sites world-

wide. For example, an order administrator in London will be able to verify stock at a manufacturing plant in Singapore while concurrently running a customer credit check on the corporate computer in Los Angeles.

Hardware and database independence is possible by designing the application using industry standard technology including SQL, the standard data access protocol.

ASK will offer the new


system alongside its MAN-MAN, MAXCIM and SIM/400 product lines. The first modules of the advanced system will be available later this year for UNIX environments and for HP MPE XL and DEC VAX/VMS computers.

Contact ASK Computer Systems, Inc., 2440 W. El Camino Real, P.O. Box 7640, Mountain View, CA 94039-7640; (415) 969-4442.

Circle 370 on reader card

Announcing...

SUPERDEX



SUPERDEX™ adds unprecedented data retrieval speed and flexibility to the IMAGE, TurboIMAGE, and TurboIMAGE/XL database environments on the HP3000.

SUPERDEX allows multiple keys in master or detail sets, generic and partial-key lookups, wildcards, automatic keywording and keyword retrieval, transparent field grouping, sorted sequential access using concatenated keys, and dynamic relational queries across multiple fields,

datasets, and databases.

SUPERDEX adds all the features you always wished for in IMAGE, with the flexibility and power of a relational database. It is a natural, compatible extension to IMAGE, using identical intrinsics and requiring only minor program modifications.

So unlock the power in your IMAGE environment. Give **SUPERDEX** a free try today.

* SUPERDEX is a trademarked product name of Bradmark Computer Systems for the SI-IMAGE package developed and implemented by Dr. Wolfgang Mann.

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BRADMARK
Computer Systems Inc.

CIRCLE 109 ON READER CARD

Belkin Components Introduces LASERLINK For LaserJets

Belkin Components has introduced LASERLINK, a line of automatic printer sharing devices for the HP LaserJet II and IID Series printers.

Two LASERLINK models are available. Model F1Y205 provides four serial ports and one parallel input port. Model F1Y208 provides up to eight serial input ports. Both models install in the LaserJet's Optional I/O slot and require inexpensive modular adapters and modular cable for serial communication. On the F1Y205, a centronics female parallel port also is provided and requires a standard IBM parallel printer cable for the parallel input port.

Both LASERLINK models permit multiple computer users to send data simultaneously to the printer that the LASERLINK stores in its 256K buffer. The LASERLINK then transmits the data to the LaserJet in the order received. The buffer memory is allocated to each document/user on an as-needed dynamic basis. The LASERLINK is designed to function with IBM compatible PCs and other PCs, and one port may be configured to function with most mainframe and mini-computers that require X-On X-Off handshaking.

Price for the LASERLINK F1Y204 is \$495. Model F1Y208 is \$595.

Contact Belkin Components, 14550 S. Main St., Gardena, CA 90248; (213) 515-7585.

Circle 391 on reader card

MAC-Based LabVIEW 2 Improves Execution Rates

National Instruments has announced that LabVIEW 2, the enhanced version of its Macintosh-based graphical programming software, began shipping to existing and new customers.

LabVIEW 2 virtual instruments now run from between 10 and 100 times faster than they did under LabVIEW 1.2, resulting in execution rates that rival those of compiled C programs. Scientists and engineers now can reduce editing time involved in creating virtual instruments by using LabVIEW 2's hierarchical menus, wire-stretching, multiple object manipulation and complete cut-and-paste clipboard capabilities. In addition, a new help

window that displays icon connections aids in the construction of the block diagram.

LabVIEW 2 is available for \$1,995. Existing LabVIEW customers can upgrade to LabVIEW 2 at no charge, new customers still can purchase the package for \$1,995, and educational institutions can receive academic discounts. Contact National Instruments, 6504 Bridge Point Pkwy., Austin, TX 78730-5039; (512) 794-0100 or (800) 433-3488.

Circle 398 on reader card

FANTASIA PC Designs Forms On LaserJets

Proactive Systems has announced FANTASIA PC Forms Designer, a software package that enables the production of all types of forms using an IBM PC compatible, such as an HP Vectra. Forms such as invoices, purchase orders, contracts, expense claims, account statements, etc., can be designed in seconds using the WYSIWYG mouse-driven on-screen design process. Forms can be printed on any HP LaserJet series printer.

Data can be merged with the form from PC application software before printing. Alternatively, the form can be uploaded to an HP 3000 minicomputer and merged with application data using the FANTASIA/3000 package.

The price is \$300 and is available on 3 1/2-inch or 5 1/4-inch disc formats. One free copy of the software is included with all licenses of the FANTASIA/3000 software and it will be distributed free to all existing FANTASIA/3000 users who have a current support contract with the next release of that software.

Contact Proactive Systems, Central Court, Knoll Rise, Orpington, Kent BR6 0JA, England; 0689 77933.

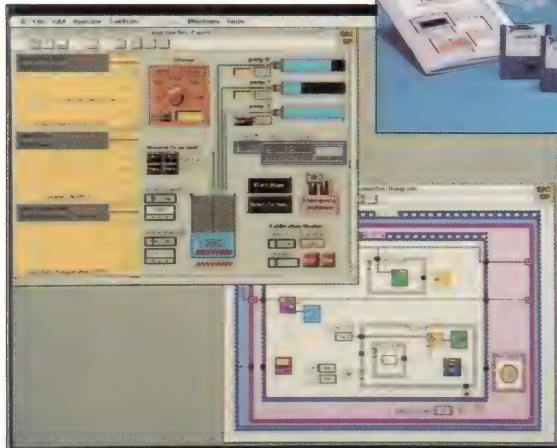
Circle 400 on reader card

TeachMe/3000 Trains MPE XL Users

Innovative Software Solutions Inc. has released "An Introduction to MPE XL," the newest module in its TeachMe/3000 computer-based training series for the HP 3000. This module



LabVIEW 2 is an icon-based graphical programming system that simplifies developing scientific and engineering application programs.



is intended for users who are unfamiliar with the MPE XL operating system and with the HP 3000 series of computers.

The module introduces the user to the major components of MPE XL and is a complement to the "MPE XL: A Programmer's Approach" TeachMe module. Topics include MPE commands, the file system, the accounting structure, language compilers and basic MPE utilities. The module uses a non-technical approach for new users and staff.

The module is priced at \$850 and is accompanied by the TeachMe driver program and an online tutorial module on the uses of TeachMe/3000.

Contact Innovative Software Solutions Inc., 10705 Colton St., Fairfax, VA 22032; (703) 273-5025.

Circle 399 on reader card

Los Altos Software Offers DBfree For IMAGE Databases

Los Altos Software has announced DBfree, a new freeform, Natural Language inquiry and update facility for IMAGE databases. It is available in both classic and Spectrum native-mode HP 3000 configurations. DBfree gives the MIS manager absolute functional control on a user-by-user basis.

DBfree offers scalable interactive help and online tutorial. Features include relational entry location, modification of critical items, segmentation, user-defined local and global work areas, menu recall of stored procedures, PC file interface, simple reporting, automatic optimum locking and mode selection, automatic dataset linkage and synonyms for all system and database elements.

Contact Los Altos Software, P.O. Box 639, Los Altos, CA 94023-0639; (415) 941-6030.

Circle 396 on reader card

GrowthPower PowerStation Links To Any Spreadsheet

Computer Solutions Inc. has announced a Standard Version of GrowthPower PowerStation that links to virtually any spreadsheet available on the market, including Lotus

Minuteman Network Manager 386 provides for an automatic shutdown and both remote and local notification in the event of a power failure affecting a NetWare 386 file server.



1-2-3. This linkage allows for the transfer of live GrowthPower data onto the spreadsheet.

The Standard Version also now links to a variety of other PC products, including dBase, Lotus Symphony, Multiplan or any other PC products that use Data Interchange Format (DIF), Symbolic Link (SYLK), ASCII text format (TEXT) or Comma Separated Values (CSV).

GrowthPower PowerStation, an information system designed for all levels of management, establishes a link between the GrowthPower Manufacturing System on the HP 3000 and the user's IBM compatible PC. PowerStation retrieves data from the HP 3000 using Structured Query Language (SQL) and allows the user to load that data onto a Lotus spreadsheet.

The Standard Version of GrowthPower PowerStation is priced at \$7,390 plus \$395 per additional PC copy.

Contact Computer Solutions, 70 Blanchard Rd., Burlington, MA 01803; (617) 229-2200.

Circle 397 on reader card

CCS Introduces MPE XL C Language Debugger

Corporate Computer Systems Inc. has introduced TRAX/C source level debugger for the C programming language on MPE XL. It enables C programmers to debug native model applications at the source code level.

Rather than inserting printf() calls into

your source code and recompiling, TRAX lets you interact with the actual application at the C language source code level. You can stop program execution, evaluate C expressions and change data values without recompiling or relinking.

TRAX software supports simple, iterative and conditional breakpoints. Commands may be attached to breakpoints so that they are executed when the breakpoint is activated. TRAX provides single step mode where individual source statements are executed one at a time. TRAX also provides machine level debugging support with its optional assembly language windows and hardware register display.

Contact Corporate Computer Systems Inc., 33 W. Main St., Holmdel, NJ 07733; (201) 946-3800.

Circle 395 on reader card

PrecisionCADD Produces 2-D Drawings, 3-D Perspectives

Land Innovation Inc., an HP VAR, has introduced PrecisionCADD.

PrecisionCADD is a general drafting software package for a variety of uses including, bridges, engineering detail sheets, waste water treatment plants, floor plans, machine components and chemical diagrams. It produces two-dimensional drawings with an option for three-dimensional perspectives. High accuracy at any scale is available.

PrecisionCADD is available for the HP 200 and 300 Series monochrome and 2-D color workstations. Minimum RAM required is 2 MB. Minimum disc drive is a 9122D, and an HP-HIL mouse or HP-HIL or HP 9111A digitizer. All HP plotters are supported.

The price for PrecisionCADD is \$1,295 plus \$35 for shipping and handling.

Contact Land Innovation Inc., 7359 Berkshire Ct., Maple Grove, MN 55369; (612) 420-6811.

Circle 388 on reader card

LANcast Introduces ETP-4380 For IEEE 802.3 Networks

The LANcast Division of CaSat Technology Inc. has introduced the ETP-4380 12-port twisted-pair wiring concentrator for IEEE 802.3 networks.

With 11 twisted-pair inputs and a single AUI port, the ETP-4380 links any Ethernet backbone to 11 individual twisted-pair nodes and provides a complete repeater function between all 12 connected ports.

By providing signal retiming, preamble regeneration, collision fragment extension and automatic port partition (disconnect) and reconnect capabilities, the ET-4380 enhances the reliability of twisted-pair networks by preventing jabbering DTEs or malfunctioning nodes from disabling the network. The effects of crosstalk and electrical noise from peripheral equipment also is minimized.

It's priced at \$2,495.

Contact CaSat Technology, 10 Northern Blvd., Amherst, NH 03031; (603) 880-1833.

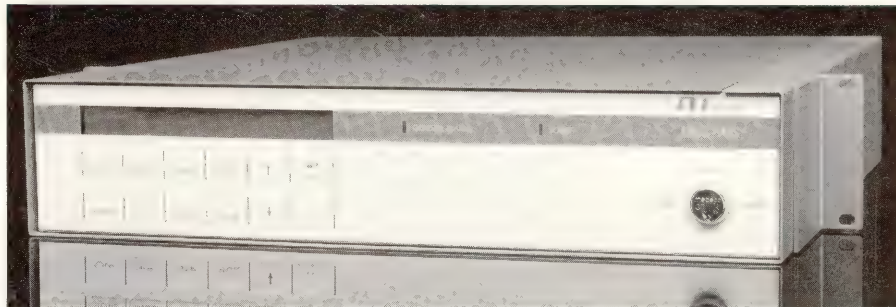
Circle 387 on reader card

ExpertWatch Provides 24-Hour Monitoring Of ILAN

CrossComm Corp. has announced ExpertWatch, a service aimed at providing LAN managers with a worry-free operation of LAN interconnection systems. The service provides a 24-hour, seven-day-per-week monitoring of customer's ILAN system and responds within one hour to detected problems.

The ExpertWatch service is made possible by new hardware and software additions to CrossComm's ILAN product. These include an integrated modem in every ILAN unit, new release IMS (ILAN Management Software) and a new software called RIMS (Remote IMS) that is used at the CrossComm Support Center to collect and process system problems.

ILAN is a system product that is used to transparently connect customers' multiple



The CKG-VHS from Cylink Inc. uses government-approved encryption algorithms to provide secure high-speed data transmission of government sensitive information over public or private facilities.

LANs into a single enterprise-wide network. Contact CrossComm Corp., P.O. Box 699, Marlboro, MA 01752; (508) 481-4060.

Circle 386 on reader card

Laser Age Offers 2-Up Signature Publisher

Laser Age Software has announced that it is shipping a program that allows HP LaserJet III printers to do two-up signature printing. Its capabilities are useful for producing booklets, magazines or other publications.

Until recently, two-up signature layout required a graphic artist to cut signature pages, sort them in first-last order, and paste them up for photo-reproduction. 2-Up Signature Publisher allows PCs to preprocess HP LaserJet printfiles for two-up signature printing.

Documents that weren't originally intended to be laid out for two-up signature printing typically have too many lines per page to fit width-wise on a rotated signature page. These documents can be printed in two-up signatures using 2-Up Signature Publisher because of its ability to scale an entire page.

2-Up Signature publisher is compatible with all MS-DOS applications that support the HP LaserJet III. Price is \$159.

Contact Laser Age Software, 3231 Ocean Park Blvd., Suite 104, Santa Monica, CA 90405; (213) 470-1397.

Circle 369 on reader card

ASCENT*DNI Connects HP, NCR To DECnet

Control Data's Integrated Information Systems (IIS) has announced the availability of ASCENT*DNI for both HP and NCR computer systems. ASCENT*DNI provides connectivity with DEC computers running the DECnet Phase IV networking protocol.

IIS introduced ASCENT*DNI in 1988 to

provide UNIX-based computer systems the ability to connect via Ethernet to DEC computers that utilize the protocols. ASCENT*DNI is an enhanced implementation of the CommUnity software of Technology Concepts Inc.

ASCENT*DNI achieves interoperability with VAX/VMS systems and migration capability to the UNIX system environment. User-Oriented Facilities include communication between tasks, file management, and electronic mail creation and exchange. ASCENT*DNI is designed to promote network efficiency by implementation of simple commands which detect a problem in the network, diagnose its cause and control network components.

Contact Control Data, 5000 Hopyard Rd., Pleasanton, CA 94588; (415) 463-6850.

Circle 384 on reader card

Cylink Develops CKG-VHS Data Encryptor

Cylink Inc. has introduced the CKG-VHS, a high-speed, full-duplex data encryptor that operates from 10 to 50 MB/sec., including the DS3 rate (44.736 MB/sec.).

The CKG-VHS was developed by Cylink under the NSA's Commercial COMSEC Endorsement Program (CCEP) for Type II products. It incorporates features found in Cylink's existing family of data encryptors, including fully electronic key management, software configurability from the front panel and remote monitoring via the Cylink Network Management System (CNMS).

The CKG-VHS uses government-approved encryption algorithms to provide secure high-speed data transmission of government sensitive information over public

Continued on page 90

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CIRCLE 104 ON READER CARD

CASE Tools To Manage Complexity

Prescient Agents

[By Scott L. McGregor]

Computer-aided software engineering (CASE) is a hot topic these days, but what is it and what can it do for you?

Well, there are many improved tools to draw design diagrams, check syntax, debug and test. But these tools only help you in a small part of the lifecycle, and many are only useful for the most technical (and most trained) programmers.

Prescient agents are what I call more accessible cross-lifecycle support tools. These agents neither require, nor interfere with other CASE tools. Rather, they make whatever CASE tools you have, even your own internal tools, easier to access and organize. These tools help manage complexity, which is really one of the most troubling aspects of software development.

When you think of CASE, you usually think of things like better debuggers, static analyzers, incremental compilers and interpreters, and language sensitive editors (collectively often called "Lower CASE"). Or, you might think of specification editors, structured analysis (SA) and structure design (SD) editors, dictionaries, repositories, and maybe even code generators (collectively often described as "Upper CASE"). There are even environments that allow you to quickly go through the edit-compile-debug loop.

There is another category I call "Mixed CASE" problems. These are the problems of communication and memory across the lifecycle. By this I mean the communication from designers to maintainers concerning not only final design decisions, but also the rationale for acceptance or rejection of designs considered. It is the

memory aids for the programmer who modified the code but can't remember where the latest specification and SA/SD documents are. It is the aids that allow two programmers to work independently on the same system and still convey to each other their full knowledge of the interrelationship of the objects on which they are working. It is the ability to answer how many other files, not just programs, will have to be modified when a two-line change to one program is proposed.

Domesticating The Computer

JOEL BIRNBAUM, general manager of HP's Information Architecture Group in several talks on "Domesticating the Computer," (see Figure 1) has described three capabilities that computers must give to humans for computers to become domesticated:

- Augment Human Memory.
- Improve Human Communication.
- Enhance Human Reasoning Ability.

I led a project at HP that built a prototype system to build prescient agents to support software developers in just this way.

How Prescient Agents Support You

AN AGENT *AUGMENTS MEMORY* by remembering where all the files are kept and having them ready when you need them. You don't need to remember their name or storage location. You feel like the computer has read your mind, or foreseen the future; I use the word *prescient* to describe this feeling.

A prescient agent *improves communication* by keeping in touch with those around you, and with whom you work directly or indirectly. The agent is able to find out things about what other people did, or are doing, in areas that you are collaborating on. Often collaborators unintentionally forget to explicitly share something with you, but the agent does not. The agent also knows about other people who are sharing files unbeknownst to you and is thus able to facilitate bartering and other forms of value exchange that begin with communication.

Lastly, because the agent helps manage data and mediate communication with others, the agent is able to *enhance reasoning* by allowing you to stay task focused, while the agent manages the communications and data storage details. Prescient agents manage this interaction invisibly so you don't have to think about anything more than using the file you want. Also, because the agent is aware of the actions of other users, it's able to help you anticipate outside changes that will alter your current work tasks. Because you gen-

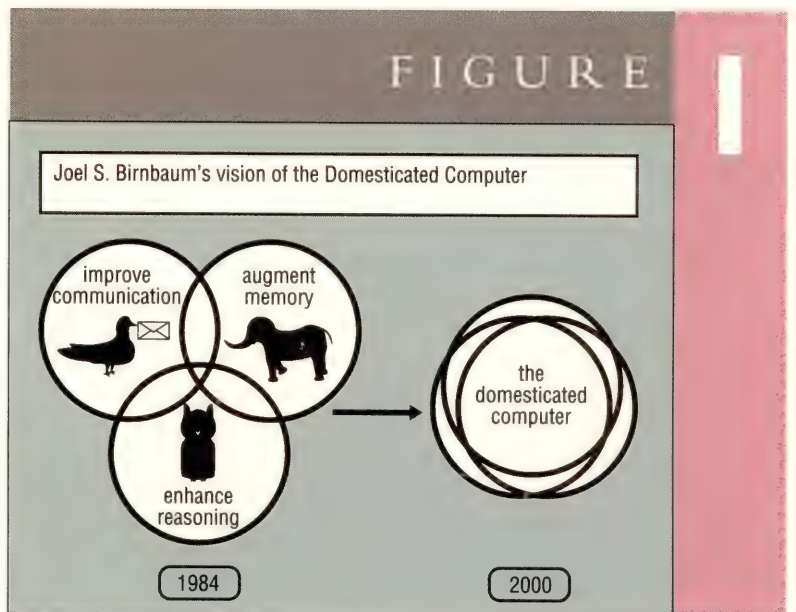
erally may not even be aware of these interactions by others until the agent brings them to your attention, this aspect often leads to an even greater feeling of prescience.

M*A*S*H Analogy

AN EXAMPLE OF A PRESCIENT agent, consider Radar O'Reilly from the TV show M*A*S*H. Radar, the company clerk, always seemed to know what was going to happen, or what was going to be said, before it happened. How did Radar do it?

Radar watched what his commander worked on, and knew he also was likely to need files that were related. Radar was able to learn to anticipate which files were related to current work based on what files were previously used. He used that information to "prefetch" a handful of files. Then, a one or two word cue was sufficient for him to choose just the right file from the handful. When his commander suddenly realized he needed a related file he would walk out of his office to ask Radar to find it. But Radar would already be waiting, and with the right file in hand.

Did Radar read his commander's mind? Of course not, but he was a keen observer. Radar was also able to anticipate what work would require interaction with others by noting where it came from, where it would go next, and who it might affect or be shared. Knowing this, he often "foresaw" interruptions and interactions that would surprise his commander. Most startling of all, Radar did this unobtrusively without having to ask directions all the time or having to be told. He merely observed carefully what his commander and others were doing. How



Domesticating the Computer.

different from most computer systems today! Most systems today are more like Corporal Max Klinger from the same show; they just point you to the file room and say "It must be there somewhere, help yourself!"

A project that I led at Hewlett-Packard developed a prototype system for software developers that learned about associative links by watching the user at work.

Domestication For Software Developers

IN THE FUTURE THERE WILL be prescient agents that will aid you in the most basic problem in software development — the management of complexity.

They will understand the very context in which you are working and they will structure themselves to help you find related work objects without facing you with the need to comprehend your position in a full hyperspace. You won't need to remember and type in the names of files and programs. They'll be represented as parts of your context and you'll invoke them effortlessly. Your contexts will be remembered, and when you wonder "Now where was I two weeks ago," you'll be able to find out instantly. You'll be able to link objects to others in your context with just a click of a button.

Most exciting of all is that a smooth migration path will exist from today's executable/data file paradigm to these composed objects via auto-encapsulation. You won't lose the ability to use your existing programming tools as you begin to utilize the new capabilities provided by the context manager. Systems will begin to appear more prescient and begin to act like your own personal Radar O'Reilly, ready with the files you want before you ask for them and knowledgeable about everyone else's activities around you that might affect you.

Excessive Overhead

WE DISCOVERED EVIDENCE THAT current systems are confusing for users because they require the user to remember and specify aspects that are peripheral to the task they are performing. We arrived at this conclusion by looking at the distribution of commands that users entered into the computer.

Some operating systems (such as UNIX) allow "history files" to be collected automatically of every command users entered. We collected a large sample of such UNIX history files from computer users throughout Hewlett-Packard and found that 25 to 66 percent of users' commands are just to navigate around and search for related artifacts in the file system. Errors also were found frequently because of this kind of navigational confusion. While our study only collected this information on UNIX, we have informally found similar levels of overhead command usage on MS-DOS and MPE.

A primary cause of this problem is that most of today's computer systems do not pay attention to the *context* in which you are working, and in fact often require you to remember how work contexts are instantiated in the current file system. You then must continually manage any translations or navigation implied by this particular mapping. The measures of overhead and types of errors observed show that much unproductive effort is necessary just to manage your real tasks.

Complexity Measures

ANOTHER ASPECT OF DEVELOPMENT complexity that we observed was the sheer number of artifacts that a software developer had to handle in a month.

We estimated as many as 10,000 artifacts/month. This seemed to fairly capture the huge number of scraps of paper, source code files and other artifacts that our developers relied upon in order to do their job. We observed that this was an order of magnitude more complex (measured in artifacts used/month) than was typically expected of other positions such as accounting clerks. I also believe that acceptance of human error as unavoidable (as opposed to something that can be avoided by proper controls in the system itself) is caused by the higher complexity of these jobs.

How Our System Worked

WE FOUND THAT software developers do work on a task by manipulating related artifacts that are the physical world projection of conceptual objects (that may or may not be represented in computer data structures). Artifacts include paper documents, voice mail or other audio recordings, video recordings, animations, drawings on blackboards and computer display images. Luckily, most of the artifacts that software developers use are already files in the computer. Other real world artifacts, such as paper documents and voice mail messages, are easily imported into computer representations using scanners or fax machines, digital signal processors, etc.

Our prototype system keeps all artifacts you use in an object-oriented repository. However, many programming artifacts are accessed as files and not true objects. They are operated on by existing programs, either purchased or locally written.

We don't wish to invalidate these tools and existing storage mechanisms, so we provide an evolutionary mechanism. Any program that you run that alters the display is automatically recorded as an object *method* in our repository and the references to datafiles it operates on are automatically stored as the *datastore* portion of the object.

Once the artifact is stored as an object, it can be manipulated by our system in ways to be described below. But you



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CIRCLE 240 ON READER CARD

can still use file system access tools to access the data and programs whenever you like. We call this transformation from file system semantics to objects *encapsulation* because you can think of the object system as providing an additional container or capsule around both the files and other object attributes.

Because, like Radar O'Reilly, our system learns through passive observation and doesn't require the user to specify how to create each object we describe this as *auto-encapsulation* (see Figure 2).

New (native) artifacts also can be created in the object do-

main itself; these don't require encapsulation because there are no existing files to begin with.

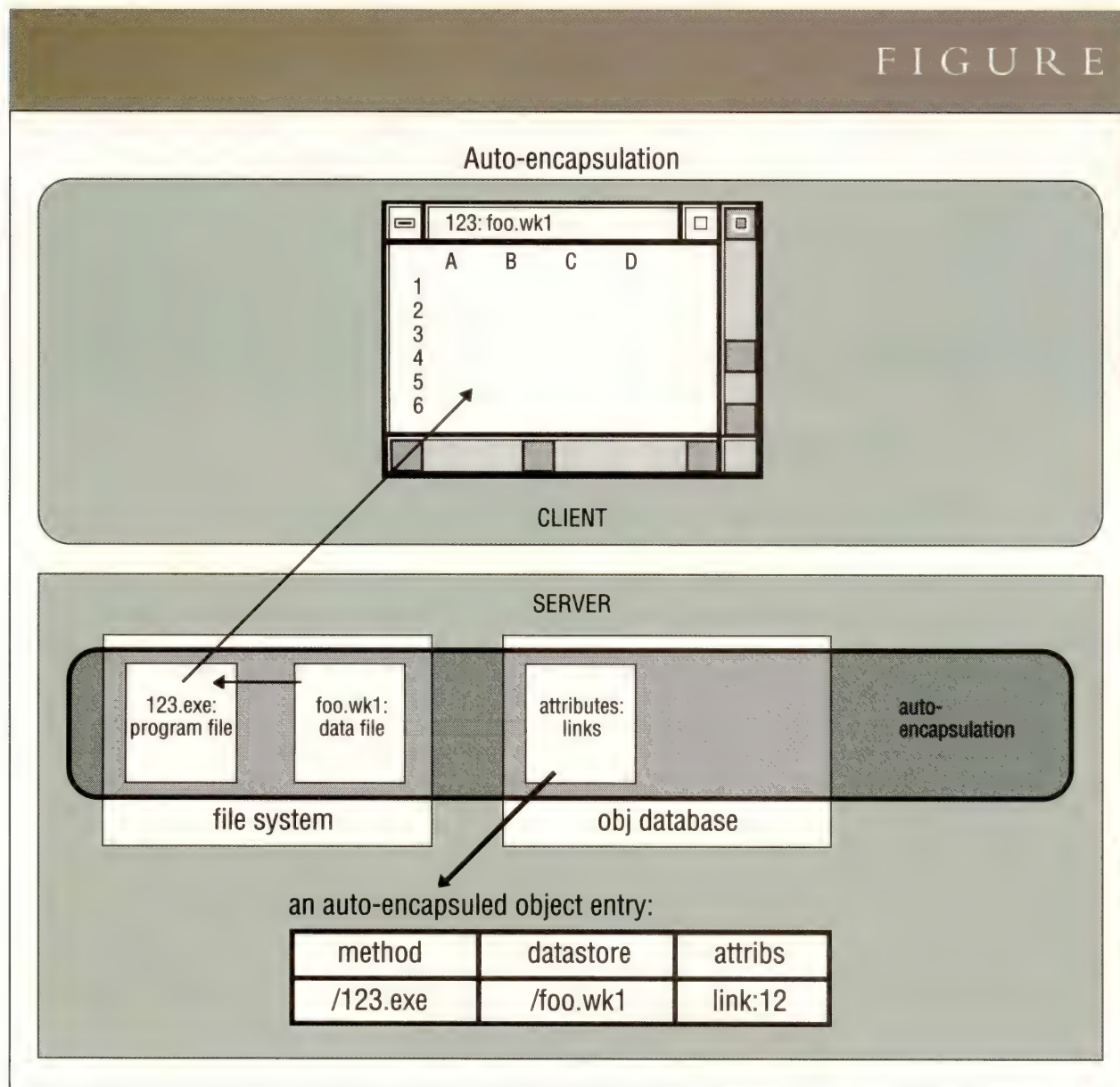
Now let's look what the object system can do to supplement the capabilities of the encapsulated artifacts.

We found that people tend to organize tasks around a number of related artifacts associated with each other temporally and spatially. We call these associative groups contexts.

Changes in work focus tends to be from artifact to artifact within a current context, in the absence of outside intervention. Contexts are built from groups of inter-related associative

FIGURE

2



For easy evolution from file based systems to Object systems ordinary commands are auto-encapsulated. The program modifies the display on the client while file and other object data are on the server. Encapsulated objects contain references to files whereas native objects exist purely in the database.

HP Deskmanager users . . .

Are You Still Chiseling Your Text in HP Slate?

Workarea > list

Item	Subject	Type	Created
1	Memo to Accounting	Package	01/27/89
2	Letter to Sales Reps	HP Slate	05/02/89

Workarea > CREATE HPSLATE
Subject: New text editor Desk

To: Mr. MIS Director

From: Secretary to the President

Ref: A better way of editing text in HP Deskmanager

The president would like to know why we have this fancy computer system and have this archaic text editor. Cave men had it easier with hammers and rocks to carve their messages. My little PC can edit better than your big main frame. We need to be able to insert words and sentences in the middle of paragraphs, move phrases around and justify right margins.

Our productivity is really suffering from all the re-typing and fussing around to get a memo into a format. It would be of great benefit to be able to take an existing file sent to me, make changes, and send it back without having to re-type it. Think of the productivity gain!

spelling
big
proper
Bold, underline

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Suppose you want to change
from your current context
to a new task. Prescient agents
allow you to not only switch
between two artifacts, but
between multiple contexts
as well.

relationships between two artifacts. We call these associative relationships links.

One key thing that our system can do is allow every artifact to support a set of links to other artifacts. These links then can be remembered and presented to you whenever you want to go from working on one artifact (e.g., a source code file) to working on another related artifact (e.g., a design description file). You no longer need to remember the related file's name or where it is in the file system. The agent remembers for you.

You can't spell it wrong because all you have to do is pick it from a list. You can't forget which program to use to edit the file because the agent remembers. Consider how many times programs have been changed but the design documents were not updated because someone forgot or could not find the design document, or because they didn't find the right one. Once the (human forgotten) links start to deteriorate, no one trusts the documentation any more and no one bothers to update it in the future, thereby ensuring its obsolescence. By shifting the burden of remembering to the agent, you can ensure reminders are given when files are changed and then related files can be updated easily.

Some links can be created automatically by agents. For example, reading a source file and determining all the files referred to in include statements.

But others, ad hoc associations, must be created by the user. The number of such ad hoc links created is proportional to their value and to their ease of creation. If it is difficult to create them, you won't bother. You can create a link simply by clicking on one object and then on another. The agent automatically calculates the proper programs to run and files to access to reanimate the related object later when you want to follow the link.

A special link that we can generate automatically is the context link based on spatial and temporal co-location of objects. So, if you have two windows on your display and one shows a source file and another a documentation file, the agent can form an implied context between the two for you to use later.

Certain objects that are commonly displayed but usually not related to current work (e.g., a clock) can be excluded so as to keep the set of contexts more meaningful. Using context links, it can become easy to return to the same visual display you were working on two weeks ago. Or, to see how another programmer's work progressed over time by watching his changing contexts.

Special placeholder objects for entire visible contexts can be stored in a ToDo list or other reminder tool for easy management of changes of contexts.

An agent that helps manage so many links and contexts might seem to make the complexity problem worse, not better. We found that was not the case. File systems (and even node and arc diagrams of file systems) face the user with much complexity because they don't distinguish between the 10,000 files out there. All are treated equally. But you aren't equally likely to access each of those files. You are more likely to access only a handful, based upon your current context. The agents use this to only show you the likely artifacts. This reduces complexity. Without this, we often feel information overload or lost in hyperspace.

Sometimes, you might want to know how many artifacts might be affected by a two-line change to one particular artifact such as a source file. For such situations, a more complex view is necessary, but that is what is being sought. But the goal must be to reveal only as much complexity as is needed for the current task.

Suppose you want to change from your current context to a new task. You always can use the file system to access other files outside the current context.

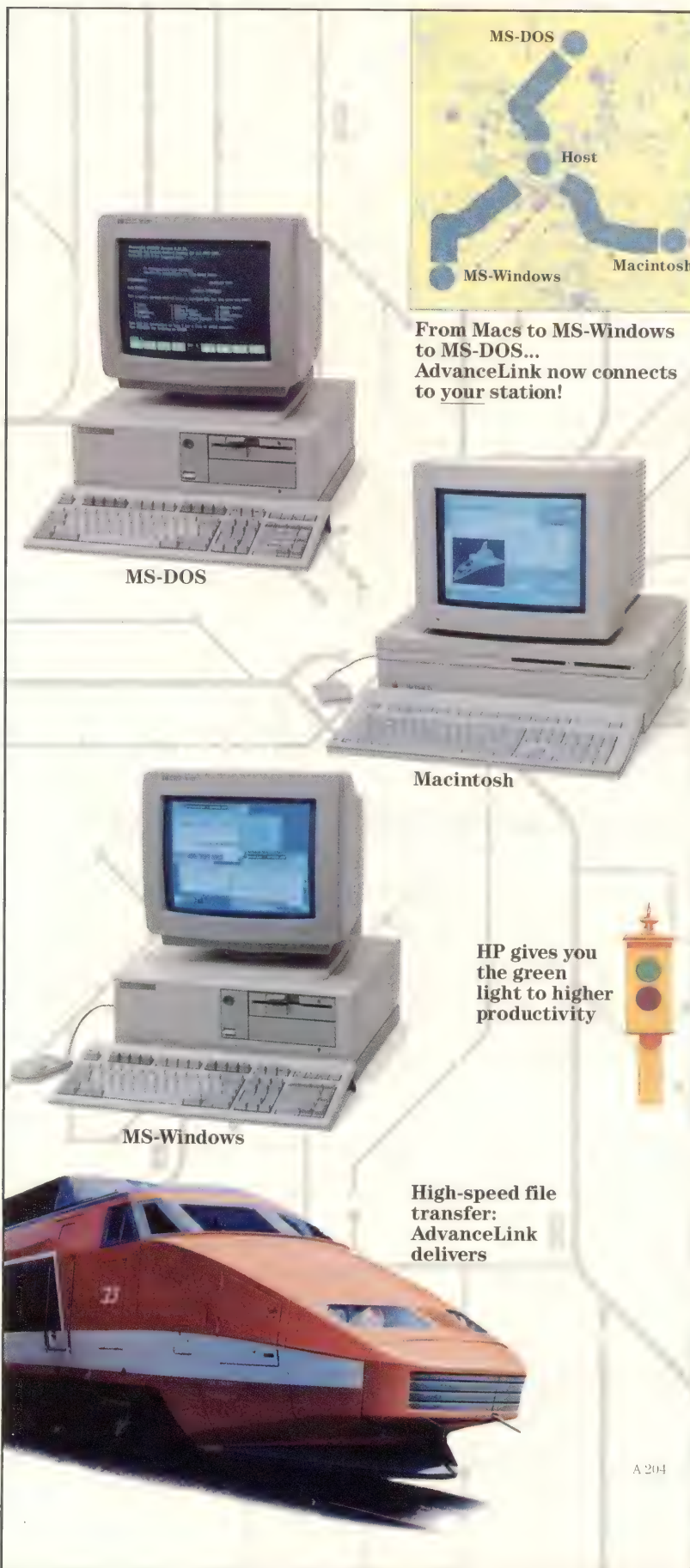
However, remember how Radar helped his commander switch from administrative tasks to dealing with incoming wounded? Prescient agents can do this too by allowing you to not only switch between two artifacts, but between multiple contexts as well. The agents can help by keeping track of others also working on these artifacts and making it easy for you to see what they are doing.

An agent is able to exhibit apparent *prescience* through recognizing your current working context and by prefetching the set of likely next artifacts you may wish to refer to (the handful of folders Radar always seemed to have).

The agent needs only a small cue to select the relevant artifacts. The agent can also have several sets of files ready for whenever you switch contexts. This is the heart of how prescient agents and environments can help manage complexity and thereby improve productivity in software development.

To understand more fully the implications of such agents in a multimedia software development environment, we created

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CIRCLE 248 ON READER CARD

a scenario which illustrates how software is done using such systems.

Getting What You Want: The RAF And RADAR

YOU MAY WONDER HOW YOU can get a Radar O'Reilly for your computer, and why one isn't already commercially available.

It isn't the technology that is missing. The building blocks, such as versioned file systems, hypermedia systems, object oriented databases, rule based systems and windowed user interfaces, already exist. They can be constructed into the usable products just as we showed with our prototype.

There are still things to learn about how people use computers to collaborate with others, but enough is known to provide initial commercial systems of this type.

What then is the major problem that has made adoption of this technology difficult? The major problem has been the lack of customer demand. Users don't know how to ask for it, nor who to ask. Customers will have to find ways to express their needs for such systems to their vendors, and vendors will have

to understand them in terms of their strengths and weaknesses to begin envisioning new opportunities for such systems.

This brings us to another story about *radar*, not the person, but the invention. During World War I the British armed forces had been surprised by the important role that aircraft had played. After the war, a British think tank was commissioned to help the armed forces with aircraft detection.

The story goes that the Royal Army asked for better listening devices to hear incoming aircraft at a mile out. The Royal Navy wanted better search lights good to two miles. But the fledgling Royal Air Force (RAF) just asked to be able to detect aircraft at the greatest possible distance.

The army got its better listening devices, the navy its search lights, but the RAF got the real valuable solution: radar.

The moral is clear: You must be careful what you wish for, because you may get your wish. If you want prescient agents, and not just better debuggers, you'll need to start talking to your vendors about Radar O'Reilly. —*Scott L. McGregor developed the concept proposal for work on prescient systems at Hewlett-Packard. He is based in San Jose, CA.*

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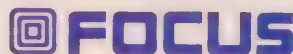
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OPTICAL Storage

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Computer and peripheral vendors are suddenly talking optical storage. They're talking WORM, jukebox, erasable, and other acronyms and buzzwords that shed light on emerging optical storage technology.

To begin with the basics, optical storage requires an optical drive, optical media, and whatever adapter or interface is required to make the drive function with your computer. If you have very large quantities of data to store (e.g., your daily backup is measured in GB), you also may want an auto-changer or jukebox, a computer-controlled robotic device that selects disks and stores them.

Optical disks come in two flavors, WORM (read once write many) and erasable (sometimes called rewritable). Although the majority of optical disks in current use are WORM drives, many were bought before erasable disks became commercially available about two years ago. Some vendors, including HP, waited for erasable drives to come to market before entering the optical market.

Drives currently come in three sizes: 5 1/4-inch, 12-inch, 14-inch, and 3 1/2-inch drives are due out soon. Except for the U.S.-manufactured Optimem 12-inch WORM drive, all drives currently sold in the HP market are made

reads like a who's who of Japanese electronics companies — Sony, Ricoh, Toshiba, Hitachi and Mitsubishi. Among the joint ventures between U.S. and Japan, Maxtor and Kabota formed MaxOptics to combine Japanese manufacturing and American marketing.

Drives use removable media that's enclosed in a hard plastic case. The 12-inch media evolved from video disks and the 5 1/4-inch drives have a similar form factor to audio compact disks. Like the drives, most of the media comes from Japanese companies, but 3M and Phillips also manufacture media.

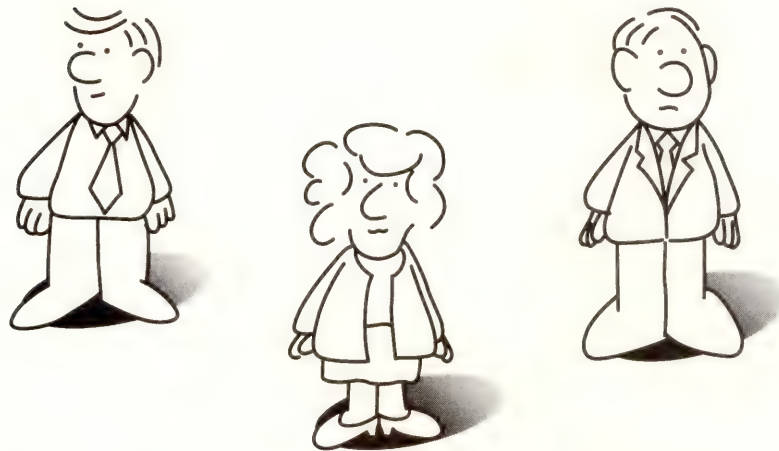
In the WORM market, almost every drive requires its own media. Although different brands of media cartridges may look almost alike, the data might be formatted in entirely different ways.

In the erasable market, standards are beginning to emerge. Recently, ISO (International Standards Organization) agreed on 650 MB as the first standard capacity for 5 1/4-inch media. The next ISO standard will be for 1.3 GB cartridges. Standard cartridge thickness is 9mm, the thickness of about five floppy disks.

Both WORM and erasable drives can be combined with autochangers. Some units with autochangers have more than one drive; HP's Optical Disk Library, nicknamed Jaws, comes with two. Presently, the number of cartridges that commercially available auto-

[BY PEGGY KING]

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changers hold range from 10 on small desktop models to 141 in a unit designed by Cygnet (San Jose, CA).

HP uses the term DASS (Direct Access Secondary Storage) as a way to position optical storage technology in between primary storage (magnetic disks) and secondary storage (magnetic tape) used for backups and archiving (see *Figure 1*). The "direct access" part of term conveys the fact that optical disks are online and can be accessed randomly, unlike tapes that have to be mounted and read sequentially in order to locate a file. The "secondary storage" part reflects HP's view that optical storage has a ways to go before one optical unit can satisfy all storage needs.

So don't throw out your hard disks. It's not yet feasible to use optical disks as primary storage devices for most applications. File access time for optical disks is measured in seconds compared to milliseconds on magnetic disks. But it does compare favorably to the minutes it takes to access a file stored on magnetic tape (or even longer when you have to search through the tape vault).

Advantages And A Disadvantage Of Optical Disks

OPTICAL STORAGE HAS advantages over both tape and magnetic media and one big disadvantage.

Durability: Optical media hasn't been commercially available for long enough to put claims of long life to the ultimate test, but it is estimated that magneto-optical media will

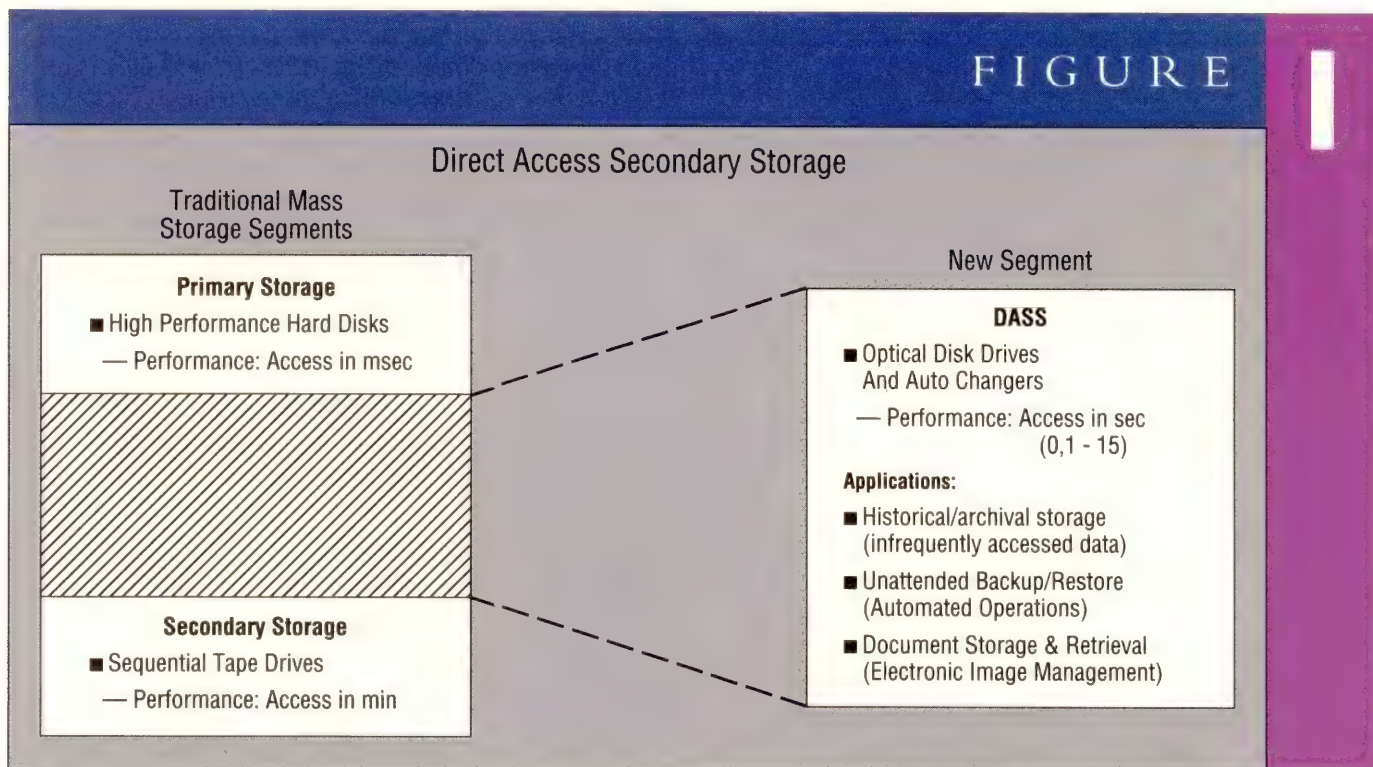
last at least 10 years and some brands test as high as 30 years. (Dye-Polymer and Phase-Change technology uses different media for optical drives, but neither of these media have become commercially available. For a detailed explanation of magneto-optical technology and information on other optical technologies, obtain a copy of *The Optical Storage Primer* from your HP representative.)

Magnetic tape stretches over time and therefore needs to be re-tensioned every few years to keep archived files readable. Tapes are subject to "bit rot," corruption caused by environmental or magnetic changes between the layers of tape stored for extended periods.

Magneto-Optical disks are not as susceptible to magnetic changes because it takes a temperature of more than 300 degrees Fahrenheit to change the magnetic orientation of a bit. Environmental contamination is less of a concern because the magneto-optical media is covered with a polycarbonate that protects the recording layer from most scratches or dirt.

With hard disks, head crashes are the number one reliability concern. Head crashes are caused by the flying magnetic head falling on the surface of the disk. In an optical drive, the head flies much further above the disk surface and is therefore much less likely to crash.

Portable media and compact drives: The space requirements of tape storage are a hidden cost of that media. An ISO standard 5 1/4-inch optical disk can hold more data than 16 times the data on a standard 40-MB hard drive. Mark Grigsby, a process improvement specialist at Hewlett-Packard's Corporate In-



HP's view of the optical market.

formation Systems (Ft. Collins, CO and Palo Alto, CA), works with data center employees who are switching their storage to HP's autochanger. One of the challenges of his role is to convince people that one small removable cartridge stores as much data as a 7935 disk drive.

Optical cartridges, like magnetic tapes, are removable, but you don't need anywhere near the space that a tape vault requires. One 650-MB cartridge will store almost as much data as nine quarter-inch cartridge tapes or 16, 1,600 bpi half-inch tapes. Although optical cartridges do cost more than the equivalent storage capacity on tape, they still save money if they are used for offsite backup. Compare the cost of renting a tape vault to the cost of getting a safe deposit box.

Because optical drives are more compact than tape drives, they save space in the computer room. Many of the drives and even the autochangers are housed in rack-mounted cabinets or designed to be mounted on 19-inch racks or mounted vertically in a desk-side cabinet.

Speed: Optical disks are not yet nearly as fast as hard disks. At best, optical disk access time is only half as fast as for magnetic and worst case is five times slower. The weight of the lenses, the laser and the mirror inside the optical head slow it

down. However, if you're doing an application like imaging, where files are large and infrequently accessed, you might not mind the slow speed.

Cost: HP estimates that magnetic media costs \$10 to \$15 per MB while today's price for comparable storage capacity on optical media (currently \$250 for an ISO standard 5 1/4-inch cartridge) runs about 38 cents per MB. As more drives become available and standards for media gain acceptance, expect optical media prices to decline the way that floppy disk prices did after PCs became popular. Soon high-capacity optical media will be cheaper than low-capacity tape.

Optical Drive Vendors As Systems Integrators

CUSTOMERS PURCHASING OPTICAL drives can get everything they need from one vendor. But the vendors have to put the pieces together. Only a few of the drive suppliers also manufacture the media. With the exceptions of HP and Kodak, most of the autochanger companies are small U.S. startups. The hardware adapter units that are used with less common disk interfaces such as HP-IB come from yet

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another set of vendors. The drive vendors add value by writing the software or firmware that makes one drive work with one computer. They also work with various suppliers to put together an optical storage solution that will work with the customers' existing systems.

There are fewer integrated optical drives available for HP minicomputers and workstations because there's a limited future in selling peripherals that use the HP-IB interface. Ironically, the optical units HP sells can only be used with the HP 9000 Series 300 workstations that have a SCSI (Small Computer Systems Interface) interface.

Write Once Optical Drives — Are They Here To Stay?

WORM DRIVES ARE NEARLY unalterable once they have been written to. They use a laser to burn microscopic depressions called pits into grooves on the surface of the disks.

Now that erasable drives are commercially available, customers have a choice and are likely to choose WORM only when they have applications that require unalterable records. Student transcripts, audit trails of banking transactions, insurance claim files, engineering drawings for military projects, and medical records are all applications where WORM might be preferred.

There's no consensus about the future of WORM drives. Bill Boles, product marketing manager at HP's Greeley Storage Division, characterizes WORM as a niche market and adds that it is possible to "erase" a WORM cartridge by deforming the bits on a track, creating a virtually blank track by replacing all ones with zeros. Currently, HP doesn't sell a WORM drive and has announced no plans to introduce one. Herstal Automation (Berkley, MI) has dropped its WORM drive from the price list and concentrates on selling a variety of erasable drives.

Dave Block, executive vice president of NSD Inc. (San Mateo, CA) believes that fewer businesses will insist on using WORM drives when they discover that data can be protected with software. "Write once is a security blanket," says Block.

Donald Orr, vice president of Ten X Technology Inc. (Austin, TX), a company that makes a SCSI bus to SCSI bus interface that allows any WORM disk to appear as a standard hard disk to any operating system, believes that WORM is here to stay. The software that drives Ten X's Optical Conversion Unit (OCU) supports file updates by writing new or updated data to a new location on the disk and linking it to the previous file. Orr says that WORM disks will increase in popularity for most storage and archiving applications because of applications like OCU that increase a WORM drive's performance and support data compression.

According to Dick Fisher, an optical industry consultant with Rothchild Consultants, "WORM will remain significant in data

management for document-based applications where it's important to maintain the integrity of the file."

WORM Optical Units Available For HP/Apollo Systems

UNLIKE ERASABLE DRIVES, WORM drives don't use the same software drivers as magnetic drives do, and each operating system needs its own drivers. Because each manufacturer's WORM drive needs software drivers specially written for the host computer it works with, not all available drives work with HP computers.

To date, there are no established standards for WORM drives. Most cartridges work only with one manufacturer's drives. WORM cartridges run as low as \$125 for the 5 1/4-inch size. Even though WORM media is cheaper than erasable, it's ultimately more expensive since it can't be reused.

WORM drives that use 12-inch platters (cartridges) have been commercially available since 1983. The 5 1/4-inch size was introduced in 1987, and Kodak brought out a high-capacity drive in 1989. IEM Inc. (Ft. Collins, CO) was the first manufacturer to offer a WORM drive specifically for HP computers.

Erasable Drives And The Emergence Of Standards

Erasable optical drives record bits in the form of magnetic fluctuations rather than the deformed pits that make WORM recording permanent. Because rewriting requires that all ones be changed back to zeros, it takes two passes to write to the media.

There are emerging standards for formatting optical media. HP has joined drive manufacturers Sony, Ricoh, Hitachi and MaxOptics to promote the Continuous Composite (CC) format for rewritable optical. Laser Magnetic Storage International (LMSI) and Pioneer support the competing sampled servo (SS) format, but neither has announced an erasable product.

Erasable drives can replace tape drives for archival purposes. For system backups, their advantage over tape backups is that unattended backup is possible and users can still access the system during the backup. These advantages become especially apparent for backups of more than 20 GB. According to HP's Bill Boles, the next release of the Team Computing product OmniBack will support network backup from Apollo servers connected to optical drives.

Storage and retrieval of large files with scanned images is one application where erasable optical drives are already beginning to be used as an alternative to magnetic disks. Image storage requires a staggering amount of memory — a full-color image with good resolution can take over 20 MB of memory, a 3 x 5 color photo takes one GB, and one minute of film is about

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28 GB. Therefore, these applications would be prohibitively expensive with magnetic storage.

Erasable drives are somewhat easier to integrate than WORM ones because they "look like" Winchester disks. Therefore, files can be stored and accessed without a special format.

Erasable drives became commercially available in 1988, but 1989 was the year of the erasable for HP customers.

Optical Outlook For This Year

More Apollo workstations supported: Apollo DN 3000, 3500 and 4500 workstations will be able to use erasable drives from HP and Workstation Solutions. To date, optical drives work only with the DN2500 because the new

machine is the only Apollo system that does not require operating system modifications to connect a SCSI optical device. Workstation Solutions is working with the Apollo Division to make the source code changes in the Apollo operating system that are needed in order to support Apollo's native file system.

Other HP Computers Supported: The HP 1000 RTE-A Series will be integrated with HP's optical disk products during this quarter. The Series 800 family of computers will be able to use HP's optical disks by release 8.0 of HP-UX, assuming that HP has provided a SCSI interface for this series by then.

"Personal jukeboxes" for PCs and workstations: Dataquest analyst Phil Devin expects half-height 3 1/2-inch units to be available from HP and IBM before the end of the year.

More options for HP autochanger units: According to Jim Jonez, a marketing manager in HP's Peripherals Group, "Cus-

[ERASABLE OPTICAL PRODUCTS]

The following erasable optical products are available:

Aquidneck Systems International Inc.

Optical Archiving System (OAS) 100 Series

Works with: HP 3000, HP 1000 and all HP 9000 models

Drive: Sony 5 1/4-inch — 650 MB

Autochanger: 56-cartridge unit from OptoJuke

Interface: Works over HP-IB by emulating the HP7970 and 7970 E tape drives. The RS 232 port can be used as a supplementary interface. Optical Archiving System (OAS) also supports the attachment of a magnetic tape drive to use for storing directly to tape and to manage data and copy files from optical disk to tape. The Series 300 workstations are integrated with a programmable SCSI interface.

Bering Industries OptiPac 7600

Works with: All HP computers with an HP-IB interface.

Drive: Sony 5 1/4-inch — 650 MB

Interface: The built-in HP-IB interface supports CS/80 and SS/80 command sets.

Herstal Automation 50625 A

Works with: HP 9000, HP 3000 and HP 1000

5 1/4-inch Drives: Ricoh 650 MB

MaxOptics Standard Density 652 MB

MaxOptics high density 1 GB

Autochanger: 56-cartridge jukebox from OptoJuke is available with one or two drives.

Interface: The National Instruments adapter box makes use of the advanced file handling features of the drives. Herstal's native mode drivers issue SCSI commands instead of emulating an HP-IB peripheral. HP-IB computers attach via an HP-IB to SCSI converter box from National Instruments that uses firmware written by Herstal.

Hewlett-Packard Series 6300

Works with: Model 650/A single unit works with HP 9000 Series 300 workstations, and Apollo DN2500 workstations. The Model 20GB/ A works on HP 9000 Series 300 workstations with HP-UX 7.0

Drive: Sony 5 1/4-inch — 650 MB (HP designed the power supply and provided Sony with a list of design specifications.)

Autochanger: HP-designed two-drive unit holds 32 cartridges

Interface: SCSI

IEM MOD5-HP650

Works with: All HP computers with HP-IB interface

Drive: Sony 5 1/4-inch — 650 MB

Autochanger: from various vendors

Interface: Attaches via an HP-IB cable using CS-80 data transfer protocol.

Pinnacle Micro (Irvine, CA) REO 650 and REO 1300

Works with: HP 9000 Series 300 workstations

Drive: Sony 5 1/4-inch — 650 MB

Autochanger: 10 cartridge model from Sony

Interface: Via a JPAK personality adapter kit available for various different operating systems and platforms including HP-UX, BASIC and PASCAL on Series 300 workstations. Commands are issued through the SCSI interface.

Workstation Solutions OFS 600E

Works with: DN 2500

Drive: Sony 5 1/4-inch — 650 MB

Autochanger: A 25-cartridge rack-mountable unit from Cygnit with one or two drives.

Interface: SCSI, using Apollo's native file system

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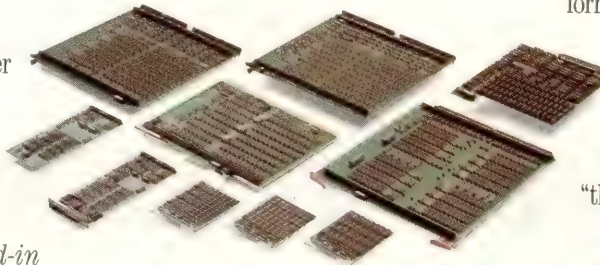
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tomers want to see a family of Optical Disk Libraries with different capacity, price and performance points." Expect to see autochangers that have more than two drives. Because they are sold on the OEM market, HP autochangers may soon show up inside boxes sold by other vendors.

Falling media prices: In some cases WORM cartridge prices have dropped as low as \$85. Many kinds still sell for about \$175, but prices are dropping rapidly. The cost of erasable media may also start to tumble after having held firm at around \$250 ever since it was introduced in 1988. Dick Fisher of Rothchild Associates expects 5 1/4-inch erasable optical disks to be selling for \$150 by 1991 or 1992.

More file management software for optical drives: More com-

panies in the HP market will start developing software that makes optical storage easier to use. NSD Inc. is working on a UNIX-based product that will manage the movement of files from magnetic to erasable storage.

The Future Of Optical — Faster And Cheaper

HP MAY BECOME THE first major computer vendor to manufacture its own optical drives. Last November HP acquired patents and engineering contracts from Optotech Inc. (Colorado Springs, CO), a company that had manufactured WORM drives since 1984. Some of Optotech's

[WORM DRIVES]

The following is a listing of the WORM drives that have been integrated with various HP computers. Because there are various methods for integrating an optical disk with a computer, the listing includes a brief description of the interface method used by each drive vendor. (For more information on various methods of optical disk integration, see "Optical Integration" in the August 1989 issue of *HP Professional*.)

Aquidneck Systems International Inc. (North Kingston, R.I.) Optical Archiving System (OAS) 100 Series

Works with: HP 9000 Series 300, HP 3000 and HP 1000s
OAS is compatible with the following WORM subsystems:
With 5 1/4-inch cartridges: Mitsui 900 MB
With 12-inch cartridges: LMSI 2 GB

Optimem 2.4 GB
Hitachi 2.6 GB
Sony 6.5[A GB (double density)

With 14-inch cartridges: Kodak 6.8 GB
Autochangers: Aquidneck's Optimem and Hitachi drives work with Cygnet's (San Jose, CA) autochanger that holds up to 141 cartridges. Sony 12-inch drives work with the 50-cartridge model from Sony, one of the rare instances where drive and jukebox come from the same manufacturer.

Interface method: OAS software emulates industry standard tape drives. The subsystem attaches to an HP-IB-to-Pertec tape coupler that is included in the price of the unit.

Delta Microsystems (Livermore, CA) Optical Disk Subsystems Family

Works with: HP 9000 Series 300
With 5 1/4-inch cartridges: Mitsubishi 567 MB
LMSI 620 MB
Pioneer 622 MB
MaxOptics 800 MB
Toshiba 900 MB

With 12-inch cartridges: LMSI 2 GB
Sony (both 2 GB and 5.6 GB cartridges work in this drive)

Autochangers: Optojuke 34-cartridge for Toshiba
Cygnet 25-cartridge for LMSI

Delta Microsystems has written software that allows the contents of an autochanger to be represented as one very large file system.

Interface methods: Delta Microsystems has written software drivers that provide various methods of interfacing SCSI UNIX-based workstations to WORM subsystems. It's possible for the WORM drive to emulate a tape drive, be addressed as one large block of data, copy files from magnetic disks to optical, or do a full virtual file emulation of a magnetic disk.

IEM Inc. (Ft. Collins, CO) Models OD5-HP 800 and OD5-HP600

Works with: HP 9000 Series 200, 300 (models with HP-IB interfaces) 500, and 800, HP 3000 with MPE, and HP 1000 with RTE-A.
With 5 1/4-inch cartridges: Mitsubishi - 600 MB
MaxOptics - 800 MB

Autochangers: IEM works with various suppliers for two-drive autochanger units.

Interface method: Systems attach via the HP-IB interface and use the CS-80 transfer protocol. IEM's ODARC (Optical Disk Archiver) used to access the drives comes in different versions for each operating system and is available for Pascal, BASIC and HP-UX on Series 200/300 workstations. The OPTIDAM (Optical Directory Access Method) provides a way to organize the disk. OPTIDAM is the same across the various HP operating systems and platforms so that files stored on one machine can be accessed on another. IEM also offers OPTIDAM (Optical Directory Access Method) software to provide a directory structure for WORM disks.

Workstation Solutions (Nashua, NH) OFS 600

Works with: All Apollo workstations

Drive: 5 1/4-inch Pioneer - 640 MB

Interface: Connects via the SCSI interface. In order to connect to Apollo workstations that use the AT bus, Workstation Solutions adds an AT-to-SCSI interface board.

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According to Jonez, HP plans to leverage the former Optotech employees' expertise to build drives especially designed to be integrated with HP's autochangers. If HP designs and sells tightly integrated optical subsystems, the company could become a leading OEM for optical subsystems in the next few years.

Other developments to watch:

Multifunction drives: As soon as WORM standards have been drafted, HP might give its former Optotech optical drive building team the project of designing a drive that can read either WORM or erasable media. The next step would be to integrate a CD-ROM reading option on the same unit.

Erasable without the erase path: Bill Boles predicts that direct overwrite (no separate erase pass) will make erasable disks read as fast as they write.

Flexible optical media: Fisher believes that "floptical" disks that can hold more than 500 MB will be available in a year or two. This media will be inexpensive, but the access time will be even slower than for rigid media.

Faster access speeds: The weight of today's optical heads cause optical access rates to be low. When holographic techniques are

used to provide a better way to channel the light from the optics, it will be possible to have a smaller, faster mechanism.

Faster transfer rates: The more information that is encoded on the media, the faster the transfer rate. By using lasers with shorter wave lengths, holes will be written closer together on the media. Another method of getting higher density is to use one hole to represent more than one bit of information.

Two-headed disks: With today's drives, cartridges must be flipped to access data on the other surface. When optical heads become smaller and cheaper, most drives will have two heads. This technology will be available for 12-inch drives before it reaches 5 1/4-inch units.

Optical drives as primary storage: Fisher predicts that optical drives will begin to replace magnetic drives as primary storage by the mid-1990s. If optical drives do become the preferred primary storage device, HP's presentations about Direct Access Secondary Storage (DASS) will go the way of the HP 150, the Series 500, HP portables and those big old tape drives that looked like washing machines.

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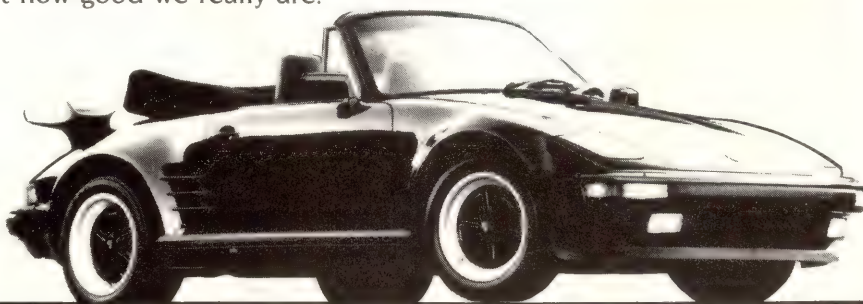
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A Comparison Of UNIX And MPE

Operating Systems Divided

[BY PAUL HOUTZ]



The differences between the UNIX operating system and MPE are a result of their different origins. The MPE operating system was originally designed as a multiuser system. It had a limited feature set, as was common at the time for vendor-produced operating systems for minicomputers. As more and more customers purchased the systems, features were added to make them more usable. MPE is now a result of more than a decade of added functions and fixed defects. The UNIX operating system originated at AT&T and was distributed to colleges and universities, as well as being used in-house at AT&T.

A major branch of the UNIX development path occurred when Berkeley gutted the UNIX kernel to add data communication software, creating an enhanced file system, which they eventually made available to the world as the 4.2 and 4.3 revisions of Berkeley UNIX. Not too long after that, HP started selling a combination of AT&T and Berkeley UNIX for the HP 9000 machines.

The major differences between UNIX and MPE can be attributed to the different environments in which they have developed. MPE developed in manufacturing and finance environments where new code is a costly and risky endeavor. Any code developed in these environments must be done so as to reduce cost, streamline a procedure, and show a direct benefit, with the tradeoff that it must cause the minimum interruption of the daily work flow.

Seemingly, many financial applications can be developed with a minimum functionality set. Many accounting applications were done on bookkeeping machines prior to being done on computers, and bookkeeping machines are only very complicated mechanical sorting and adding machines. This clearly can be seen when many financial applications are examined more closely.

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When you examine the basic functionality of MPE that's used in most business applications, you see several things. First there are flat files that are used to store data, and are the equivalent of punched cards. Then you see a sort program that does strict column sorting (the equivalent of mechanical card sorters). You also see COBOL programs that are in many cases a simple description of how to process a given task (for instance, how to calculate payroll deductions from tax tables) — the equivalent of the clerk who used to follow the repetitive instructions with a mechanical adder, etc.

Even the VPLUS system is taking the place of an electro-mechanical card punch.

In addition, there are many enhancements that have been added to make life easier over the years. A database system, Image, was added to make organizing and accessing data faster and more powerful. Also, a keyed sequential file access system was added for generic searches and inquiry. VPLUS was enhanced to perform a great deal of editing of input data, in addition to making it prettier, faster and more flexible.

Over the years, a file copy utility has been developed and enhanced so it now can reformat data from virtually any system on an HP 3000.

The applications also have become much more complex, to

ence curriculums, the work flow is the coding and debugging of computer programs. Also, the UNIX kernel was developed in the late 1960s by computer hackers. The basic idea of the UNIX kernel involved (at the time) advanced concepts such as the "toolbox" approach to software development, structured methodology and filter programs.

It appears that the initial idea of the UNIX system was to support word processing and software development in a multi-user environment. The applications and utilities that have been accreted to the UNIX system have followed the same ideas. In addition, many varied utilities have been added through association with the student environment. Therefore, the UNIX system environment has many more utilities to accomplish many more tasks than the MPE operating system.

Differences Between MPE And UNIX

THERE ARE FIVE BROAD CATEGORIES of differences: file system user interface, utilities, OS command programming, data management and portability.

The MPE operating system provides a non-hierarchical three-level file system user interface. The names of files consist of three parts, the FILENAME, GROUP and ACCOUNT. It's non-hierarchical because all files must have all three parts to the filename. There are hierarchical aspects to the filename, in that files reside in Groups, which in turn reside in Accounts, but you can't have a file that resides simply in an account with no group.

The rules governing the names you can give files, groups and accounts are the same. They must begin with an alpha character, and consist of eight or less alpha or numeric characters. Special characters aren't allowed. This means that a "fully qualified" filename can consist of at most 26 characters (three eight character names delimited by the . character), and must consist of at least five characters (three one character names delimited by the . character).

The defaults can be assigned to users so that only the filename need be specified if the file is in the user's home group and account, and users can create their own accounts, groups and files, provided they have sufficient capabilities.

An example of a fully qualified file name in MPE is:

```
MYFILE.PUB.SYS
```

where MYFILE is the filename, PUB is the group name, and SYS is the account name. If the user's home account was SYS and home group was PUB, then they could refer to the file as simply MYFILE.

The UNIX operating system provides a hierarchical multi-level file system user interface. A file can reside in the root directory, such that only the filename and at least one character

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the point that COBOL financial applications today bear little resemblance to the strict set of instructions given to bookkeeping machines of the past. Also, a large number of the applications used in the MPE world were developed on other platforms, such as IBM. The use of COBOL allows for migration of those applications to MPE.

In comparison, many UNIX systems were installed at colleges and universities, where there wasn't a lack of programming talent, or time to develop new code. There also was no work flow to be interrupted by bugs. Indeed, in computer sci-

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directory name need be specified to completely identify the file, for example:

```
/temp
```

where / signifies the root directory, and temp specifies the filename.

In addition, UNIX allows users to create their own directories to virtually any depth they need, and to create file and directory names with many more than eight characters.

In absolute terms, the UNIX file system doesn't allow you to have more files than the MPE file system. The number of unique filenames you can generate with the above stated rules for MPE names is somewhat over 78 billion. Theoretically, you could have 78 billion accounts with each account having 78 billion groups, and each group having 78 billion files. Obviously, you're going to run out of space on the system long before you run out of filenames.

The problem is it's difficult to give files descriptive names, and it's difficult to organize a large number of files, in comparison to the UNIX file system.

The advantage of the MPE system can be seen in terms of performance: It takes less time to traverse the relatively simple directory tree of an MPE system than the complex directory structures of the UNIX system.

If you refer back to the origins of the MPE system, you'll see that this fits right in with the history and emphasis of MPE. Performance of the operating system is more important than convenience to the user. Again, think of the electro-mechanical sorting machines. These machines sorted boxes of punched cards. The filing system on MPE is simply a minimum enhancement over this system. The cards now are kept on magnetic disk, and in addition, they can be kept in stacks three levels deep.

Any more convenience detracts from system performance and is considered unnecessary. If a user tends to forget what files with names like "datafle1" contain, let him create his own directory file with a description of the contents of his files.

On the other hand, UNIX developed away from the card-oriented environment, on interactive terminals. The link with punched cards is completely broken. This is one reason why UNIX file sizes aren't reported in terms of records (cards), but in terms of bytes.

UNIX began with a hierarchical file system that contributed to its acceptance in the scientific and educational community. The computer is used for a wider variety of applications in these communities than in business data processing. It's more convenient to accommodate these applications if the file system is more flexible. Also, the flexible file system makes it easier to keep track of complex application code. Enhancing the file system also is easier to accomplish when there's little production code running on the system. Therefore, we've seen many improvements to the file system over the years.

I don't mean to indicate that *no* or *less* production is run on UNIX systems as opposed to MPE systems. Quite the opposite is probably true. However, it's fair to state that there are a far larger number of UNIX systems that *do not* run production. For example, compare the number of MPE systems that are used strictly for student accounts to the number of UNIX systems that are used strictly for student accounts at colleges and universities across the nation.

If someone wanted to make a change to the file system on UNIX, there are thousands of systems where the change could be tested without loss of revenue to the users of the system. The same is not true of MPE.

Utilities

ONE THING I NOTICED when I first used UNIX was the bewildering array of utilities available on UNIX. In retrospect, it seems this is more because of the lack of utilities on MPE than it is because of the large number on UNIX.

In the way of general utilities, MPE has only the utilities necessary to support a data processing production environment. For years MPE contained only such primitive utilities as patch and debug, a generalized data copying utility called FCOPY, a basic line-oriented editor, a tape backup utility, sort, etc. A notable exception to this minimal functionality is in the data management area.

On the other hand, UNIX has utilities for searching for strings in any file in the directory, sorting, splitting text files, source code version control, traversing the directory, listing strings in executable files, etc.

I think that MPE has few utilities because it doesn't have a great educational market penetration, therefore it doesn't have a large amount of "free" programming expertise to draw upon.

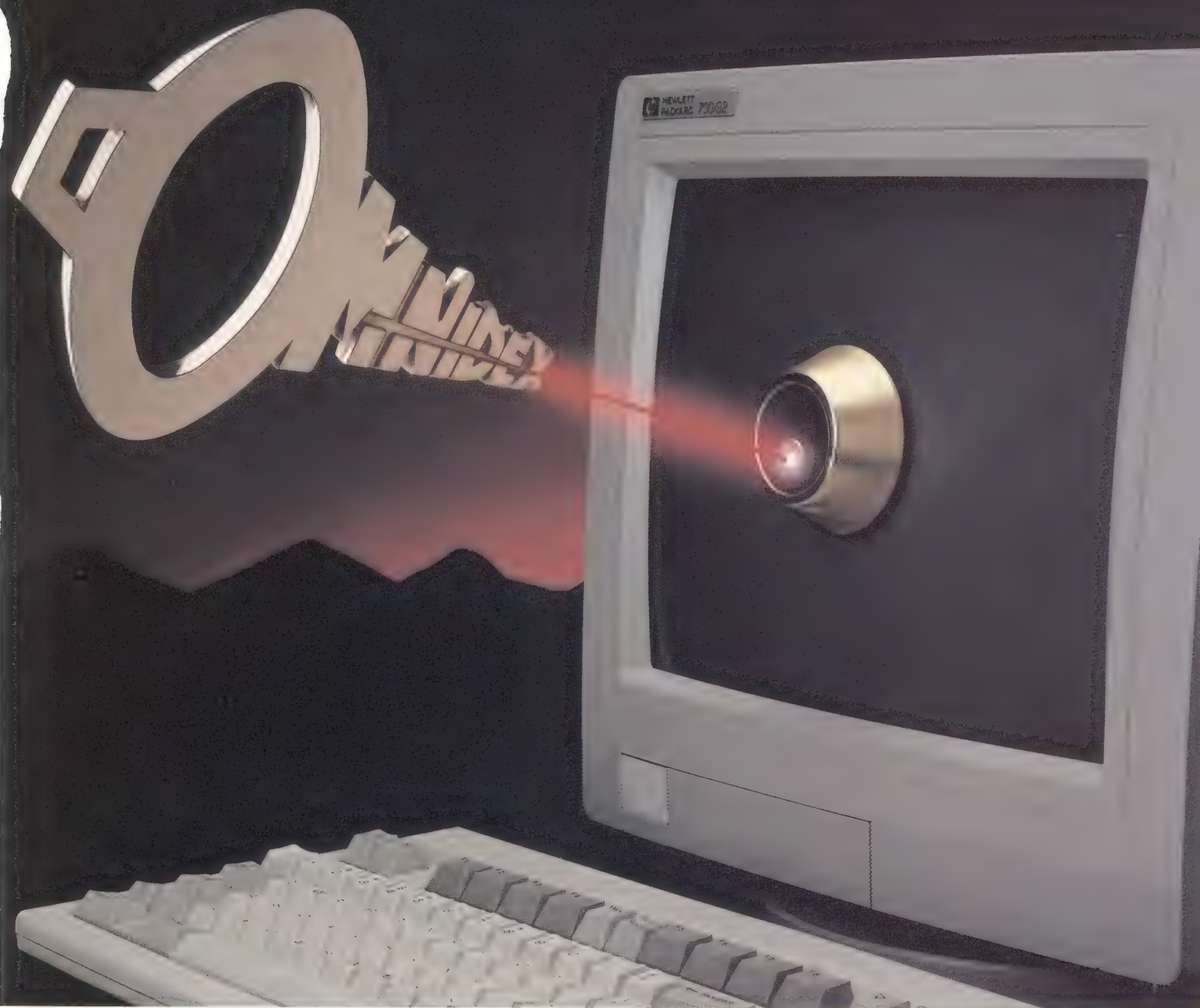
Because of this, you can note that most of the utilities extant for the MPE system have been supplied by third parties, either as "accessories" to their application systems, or as specific utilities packages, bundled together. Either that, or they are utilities that serve a specific need, such as data management utilities and editors.

These utilities have been created to fill important holes in the MPE system functionality. The only reason their authors created them and marketed them is because the products are needed enough that people will pay for them.

OS Command Programming

IT IS VIRTUALLY IMPOSSIBLE to create a useful application entirely with MPE Command Interpreter commands. MPE was not designed for this. MPE has been optimized to support database applications and report programs.

When MPE was designed, extracting data was done by pro-



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grams written in a high-level language such as COBOL or FORTRAN. Therefore, the OS supplies commands to access files, compile and prep (link) programs, run programs, and create and remove files. Access to files would be done by a program that would open the file, read it, write to it and close it. When considering the class of applications that run on the machine, the idea of making it possible to connect standard input to standard output (piping) or of making it extremely easy to redirect output and input wasn't considered important.

On the other hand, UNIX gives you the ability to redirect standard output, standard input, and to pipe two programs (called filters) together so that one feeds the other record by record. This method of connect **stdin** to **stdout** on UNIX is very convenient. Also, redirection of **stdin** and **stdout** is very convenient, requiring only a single character (`>`).

Only recently has it become practical on MPE to connect two processes input and output together (through message files), and it still isn't at all easy — it requires a programmatic interface. Also, it has only recently become easy to redirect standard input and output for those programs that use them (via the **STDIN** and **STDLIST** options of the **RUN** command). The problem is, many programs don't use **\$STDIN** and **\$STDLIST**, because there has not always been a great advantage to doing so.

One important aspect of MPE's limited command language is its safety. It is, in my opinion, much more difficult to "shoot yourself in the foot" on MPE. You can't remove or rename groups of files. These things must be done one at a time, unless you wish to remove entire groups or accounts, and then you must use a different command.

Also, because you always get an error when you try to create a file with a name that already exists, you never accidentally write over files when redirecting input and output. You must take these things into account when trying to determine the productivity of non-technical people using the systems.

Another aspect of the MPE system is the ability to have run-time libraries. This is an area where MPE is superior to most UNIX system environments. The run-time libraries make executables far smaller in size, and make for a much more flexible executable environment.

Finally, MPE XL has implemented many enhancements to the command programming language. It is possible to write user programs using MPE XL commands. In my opinion it's still a long way from the various UNIX shells, but it's a great enhancement over MPE.

Data Management

DATA MANAGEMENT IS THE AREA where the difference in emphasis between the MPE system and the UNIX system can be seen the strongest. The UNIX system has no built-in high performance data management system. MPE has Image (now called TurboImage). MPE has had

Image since the first volume shipments, and it is the Image database management system that has made MPE a success in the commercial market place. Image is a very fast hierarchical database system that is extremely useful for financial applications, particularly in a transaction management environment.

It's interesting to note that the first database systems that have gained acceptance on UNIX systems are relational database systems, such as Oracle and Ingres. Relational DBMSs are very flexible database systems, but they are low performance in comparison with Image. This fits my model of the two systems quite well.

Another data management tool that MPE has that's superior to the UNIX offering is VPLUS. VPLUS is an extensive package for designing data-entry screens for HP terminals. Again it's notable that this was added to MPE early to support data processing environments.

Finally, when I first started working on UNIX systems, I was struck by the lack of a tape backup utility in the UNIX system. MPE has a subsystem called STORE/RESTORE that automatically writes files to tapes, tracking the end of tape marker, requesting additional reels, keeping a directory on the tape, and allowing for file by file restores. The shop I currently work in had to create its own utility to do this for the UNIX systems. Of course, there are third-party packages to do these things for UNIX, and there are various utilities bundled into hardware vendor's implementations of UNIX, such as the **fbackup** utility that's part of the HP-UX version of UNIX. However, these are not standardized throughout the UNIX world.

This makes sense when you consider the value of the data in a typical data processing environment, and the cost-effectiveness of having operators do tape backup rather than programmers or engineers.

Portability

ONE OF THE HIGHLY touted features of UNIX is that applications developed on UNIX can run on many different types of hardware. UNIX has been hailed as the portable operating system.

MPE, on the other hand, runs only on HP computers, and only on HP 3000 models. This is because MPE is a proprietary operating system. HP sells MPE because it wants people to buy HP computers. UNIX, on the other hand, was developed at a time when AT&T was restricted from marketing software because of certain antitrust restrictions. They were required to offer anyone a license to UNIX. Otherwise, you can bet that UNIX would be a proprietary operating system as well.

However, regardless of AT&T's intentions, UNIX has caught on. Many companies regard proprietary operating systems as a noose around their necks; once they have a significant investment in software for a given operating system, they are loath to attempt to migrate it to another type of operating system,



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Only time will tell if UNIX is the operating system standard of the future, and how long proprietary operating systems like MPE will survive.

and for good reason. I remember a study of such migrations during the 1970s. It reported that half of all companies that changed computer vendors for their financial systems went out of business in the process.

This makes UNIX very attractive to companies for their computer applications. The reasoning is that if the application runs on UNIX, then they can port easily to a different hardware if they don't like the support, or if the current hardware "runs out of gas."

More importantly, this makes UNIX very attractive to software developers. It is very cost-effective for a third party to develop software for the UNIX system. They can simultaneously leverage a large number of customers on many different hardware platforms. This means that another advantage of the UNIX system is that there is more software available on UNIX by third-party developers.

Also, it isn't necessary to develop software on the UNIX operating system in order to leverage a large number of systems. Just as it is possible to create software that is difficult to port on a UNIX system, it also is generally possible to create software that is easy to port on a non-UNIX system.

By taking advantage of widely used and standardized compilers, such as C, PASCAL, and COBOL, and understanding well the machine dependencies, developers can create portable software for most operating systems, and MPE actually facilitates this more than many systems. In particular, MPE has industry standard COBOL, PASCAL and FORTRAN compilers, which can compile code from many other systems.

Also, because MPE has few utilities, application systems built upon it tend to have fewer dependencies, i.e., the code for the application does most or all of the work. The few utility systems MPE has, such as KSAM, SORT, etc., generally are available on other operating systems, or from third-party vendors. Even Image, the database management system supplied with MPE has relatives on other operating systems.

The key to portability is isolating or eliminating machine dependencies. Many times machine dependencies can be eliminated from applications without significant degradation in per-

formance. Applications such as data base management systems, data communications system, forms management systems, etc., are heavily dependent upon the machine. But these make up the smallest minority of applications; most business applications and many technical applications don't require machine dependent features for performance reasons.

Those applications that do require the use of machine-dependent features can be designed in such a way that the bulk of the code doesn't know about the machine-dependent features; that it is masked from the logic of the application. This is how they are "isolated" so that most of the application can be left untouched when porting from one system to another.

UNIX does much of this isolation by requiring you to move from one UNIX system to another; the software developer can allow more business choices by doing the isolation himself. Then his software can be ported to any operating system, including UNIX.

Simply, MPE and UNIX are products of their environments. MPE developed in the process of meeting the needs of business data processing customers, and UNIX developed by meeting the needs of scientists, software engineers and students.

It's easy to see that demand has been the major force behind the development of the MPE operating system. The areas that have been developed are those that are most cost-effective in a data processing environment. It's equally easy to see that the UNIX system is more modern than MPE, and that the areas that have been developed in the UNIX system are those that appear most desirable to software developers.

Demand now is driving a new force in the data processing industry, and that force is standardization. People are beginning to see the waste of time and effort involved in relearning new operating systems, and the difficulty of porting applications. Only time will tell if UNIX is the operating system standard of the future, and how long proprietary operating systems like MPE will survive.

It seems that UNIX requires additional functionality to support commercial applications as well as MPE does. The features are being added by third parties, but there is very little standardization among those third parties. This will present a portability problem for future applications. So far, we have seen some trends in overcoming this problem; customers are asking more and more for standardization among utilities. For example, relational database systems accessed through SQL are popular because of the perception on the part of customers that SQL is a "standard."

The extent to which the strengths of commercial operating systems like MPE can be standardized and built into UNIX will determine its usefulness in the commercial software marketplace of the future. —Paul Houtz is a software development engineer at Hewlett-Packard Corporate Quality Department in Palo Alto, CA.

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INTERNAL SPECIFICATIONS

Ending The Development Nightmare

Does this nightmare sound familiar?

You're working on a complex software application. You've completed a great External Specifications (ES) document, and maybe a prototype of the new system, and the users are very excited about the functionality they are going to get. Now it's time to write an Internal Specification (IS).

No one on your team quite knows what that is, but you look around at documents from other projects, and you end up with a slightly more technical document than the ES, but with little more detail or logic specification than before.

Or, worse, you decide to dispense with the IS entirely and go straight to coding. Once you begin coding, you discover that new modules don't talk to each other correctly, and data is mangled in the process. The changes to existing modules are harder than you thought, and you have to start over several times before you can incorporate the new functionality correctly.

Your project manager is getting crazy because now you're months behind schedule and your testing uncovers defect after defect. After six months of work, you seem no closer to being done than when you first started coding. You begin to consider an alternative career in fast food.

Writing An IS

Without much exaggeration, I have experienced this scenario on several different projects. The level of detail provided in the IS documents, if it existed at all, was woefully inadequate once it came time to code. The results typically were very high rework levels in the coding stage, high defect rates, severe problems in scheduling the project, and serious morale problems with the project staff.

Therefore, when it came time to write an Internal Specification on our current project at Hewlett-Packard, the Worldwide Order Management System (WWOMS), we took a different approach. We did some research on what

other teams were doing and built on our knowledge of what had worked well for us in the past. Also, we worked closely with our system audit department. The auditors were very concerned about development teams writing an adequate IS document that could bridge the gap between the ES document that showed the system from a user's perspective, and the code itself. The IS had to provide enough information so that coding could be done easily and so that business functions and business controls could be implemented correctly.

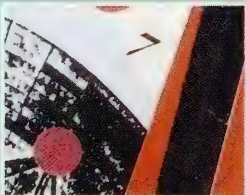
In the end, we decided to write a detailed specification — down to the pseudo-code level. We followed a standard format for each module and inspected each one as it was completed. This is well worth the time.

Various Approaches

During our research with other project teams, we discovered several very different approaches to IS documents. Some teams were using PC-based tools to develop specifications. These tools provided module charts and data dictionary layouts for the new applications. This approach seemed promising and worked very well for the development of brand new systems. Our project, however, was based on existing code and involved merging functionality from three different current systems. The applicability of the PC tools approach to this situation seemed limited. We would need to input a considerable amount of data about the existing software before we could move forward with the tools. We weren't sure that the investment was worth the effort.

Other teams wrote high-level documentation from a technical point of view. This approach was much like an ES, but with some additional information about file structures and data and control flow between modules.

This approach worked well for simple, small projects, but frequently failed when applied to complex or larger systems. We had taken a



DEVELOPMENT

Lisa Burns

similar approach with a previous project, and had had limited success. The document didn't provide enough detail to code from, and we had to do a lot of rework to make the code work. The project fell behind schedule, and although at last it was completed successfully, the team was very frustrated.

Finally, some teams working on projects involving changes to existing systems were taking a very detailed approach. These teams were writing out all code changes to existing modules and were writing pseudo-code for new modules. This approach was time consuming and difficult. However, once the IS document was complete, coding could be done very easily. In fact, code could be written by new people or by contractors in addition to experienced project team members. Coding and testing seemed to go much faster with this technique than with others.

Pseudo-Code Level Approach

Based on this research and on our own system development experience, we chose the detailed, pseudo-code level approach. Each change to existing modules would be written out ahead of time. New modules would be specified completely in pseudo-code. Changes to file layouts, database schemas and copylib members also would be written out. Each module would be inspected in a software walk-through before any construction began. All decisions and changes specified for a given module would be kept in that module's project folder for reference.

Standard Internal Specifications Outline

Title of Module
Screen or Report name:
Program name:
Linkage parameters:
Subprograms and subroutines called:
Copylib members:
Databases used:
File layouts:
Error codes:
Paragraphs affected (for changes to existing code):
Narrative Overview/ Problem statement:
Logic Flow of new or changed code:
Changes needed to existing code:
Logic for new code (in pseudo code):

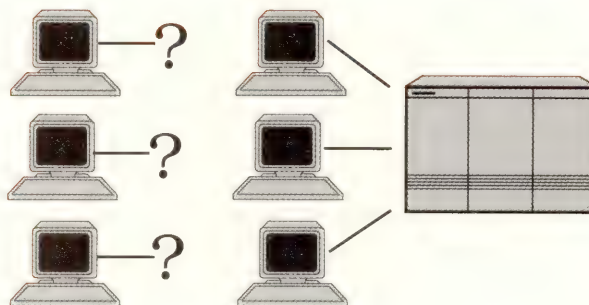
Figure 1: The IS document outline.

We began our Internal Specification phase by setting standards for what would be included in a given section of the IS document. The outline is shown in Figure 1. We had a fairly good idea of what we wanted when we started the IS phase, but this final format evolved somewhat during the first few weeks of the IS phase. In the end, programmers adjusted the

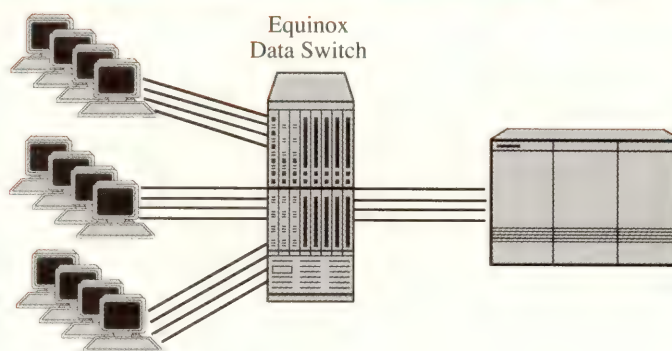
outline slightly and added or deleted topics based on the particular program involved. Programs for reports and interfaces didn't include a screen, for example.

The bulk of each IS module was written in Executive Memo Maker. We standardized on this editor because of its ease of use and because files easily could be uploaded to the HP 3000 for compiling.

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Narratives and large sections of new code or pseudo code were kept as disc files so that they could be incorporated in final versions of programs without retyping.

Figure 2 shows an excerpt from an IS section including large sections of new code. The code sections will be uploaded from the PC to the HP 3000 during cod-

ing, and then will be compiled on the HP 3000 with minor changes.

For simple changes to existing code, however, we found that it was cumbersome to note the changes online as part of the electronic source code file. In these cases we simply made copies of the old source code and noted the changes

by writing directly on the listing itself.

Figure 3 shows an example of an IS section for changes to existing code. The changes simply can be made during the coding phase by adding the new lines in the existing source file.

Once the programmers agreed on the standards, they dove into the analysis of the

IS SECTION WITH CODE CHANGES FOR ELECTRONIC UPLOADING

OMS1110 OVERVIEW

OMS1110 is the program which assembles the OPC packets in the Send-to-Heart/Cochise process. OMS1110 is one of three programs currently called by the driver program OMS1100. These programs are:

OMS1110—ASSEMBLE OPC PACKETS
OMS1120—RECOVERY
OMS1130—INQUIRY/RECONCILE

In WWOMS a fourth program, OMS1140, will be called to process OSS records.

The basic functions of OMS1110 are as follows:

- (1) Read the ORDER-DETAIL dataset of OMSDB, looking for orders ready to be transmitted to Heart/Cochise. An order is ready for transmission when the I110-XMIT-READY = "YE".
- (2) Write all orders having the I110-XMIT-READY = "YE" to a ready-to-transmit file.
- (3) Sort the ready-to-transmit file in ascending ORDER-SEC-NUM.
- (4) Read the sorted ready-to-transmit file and, depending upon the value in I110-PENDING-ACTION, execute one of five basic processes:

New order
Change order
Cancel order
Change PSID
Close order (new to WWOMS)

In each of these five processes, the appropriate OPC records are written and assembled into packets for transmission to Heart/Cochise.

OMS1110 will also, with the advent of WWOMS, set a trigger flag to signal the Send-to-TIGER program to send a TT57 to TIGER. In addition, WWOMS OMS1110 will send a TT56 to Heart/Cochise to denote customer deliveries.

TT57 Invoice Trigger

OMS1110 will check the field I610-TRIGGER-EARLY to determine if the office is allowed to trigger invoices to TIGER for implied ship or over-the-counter orders. If this flag is set to "Y", OMS1110 will check the field I120-SHIP-DATE to see if it contains a value. If it does, this means that the order is either an implied ship or over-the-counter sale. In such a case, OMS1110 will set the I110-TRIGGER-TYPE to "Y" so that the Send-to-TIGER program will know that it should send a TT57 transaction to TIGER.

(For the present time, it is assumed that I110-TRIGGER-TYPE can be set by OMS1110 as a flag as described above. This assumption will be in effect until it is determined exactly what field TIGER needs for this purpose. I110-TRIGGER-TYPE will be used if such use is consistent with TIGER's anticipated use of this field.)

There is an additional data check made once OMS1110 has determined there is a value in I120-SHIP-DATE. That is, OMS1110 will compare the ship date with the system date in order to see if the ship date is earlier than or equal to the system date.

Also, it is possible that the code changes listed in this document may be incorporated into the Send-to-TIGER program at a later stage.

Add the following lines to D5310-NEW-ORDER-ADD, page 132, after line 169.0 (just before D5310-NEW-ORDER-ADD-EXIT)

```
* [ DETERMINE IF THE OFFICE IS ALLOWED TO TRIGGER INVOICE TO
* [ TIGER FOR IMPLIED SHIP OR OVER-THE-COUNTER ORDERS
* [
* [ IF THE OFFICE DOES HAVE THE CAPABILITY TO TRIGGER INVOICES
* [ DETERMINE IF THE SHIP-DATE CONTAINS A VALUE. IF IT DOES,
* [ THIS MEANS THAT THE ORDER IS EITHER AN IMPLIED SHIP OR
* [ OVER-THE-COUNTER SALE. IN SUCH A CASE, THE
* [ I120-TT57-INVOICE-FLAG WILL BE SET TO "Y" SO THAT THE
* [ SEND-TO-TIGER PROGRAM WILL KNOW IT SHOULD SEND A TT57
* [ TRANSACTION TO TIGER.
```

```
IF I610-TRIGGER-57-EARLY NOT = "Y"
NEXT SENTENCE
ELSE
IF I120-SHIP-DATE NOT = SPACES
IF I120-SHIP-DATE
PERFORM D5380-SET-INVOICE-FLAG
THRU D5380-SET-INVOICE-FLAG-EXIT.
```

Add the following paragraph, after line 185.2, page 136. (This paragraph will follow the new paragraph D5370-UPDATE-FLAGS).

```
$PAGE
*****
*
* THIS ROUTINE WILL SET THE I110-TRIGGER-TYPE TO "Y".
*****
```

D5380-SET-INVOICE-FLAG.

```
DISPLAY "NOW ENTERING D5380-SET-INVOICE-FLAG.".
MOVE "D5380" TO PARAGRAPH-NUM.
MOVE "Y" TO I110-TRIGGER-TYPE.
```

```
MOVE I000-OMS-BASE TO ICP-BASE.
MOVE I110-ORDER-DETAIL TO ICP-DSET.
MOVE I110-BUFFER TO ICP-BUFFER.
```

```
IF I110-FIRST-ACCESS
MOVE "NO" TO I110-FIRST-ACCESS-FLAG,
MOVE I110-LIST TO ICP-LIST,
ELSE
MOVE ICP-SAME-LIST TO ICP-LIST.
```

```
PERFORM DB-UPDATE
THRU DB-UPDATE-EXIT.
```

```
IF ICP-COND-CODE NOT = ZERO
THEN
MOVE SPACES TO W100-GLOBAL-ERROR-AREA;
MOVE COND-CODE IN FIND-GET-PUT-CODES IN DB-CONTROL TO
W500-IMAGE-ERROR-DISPLAY;
STRING "IMAGE ERROR:",
W500-IMAGE-ERROR-DISPLAY,
" DURING DBUPDATE USING ORDER-SECTION NUMBER: ",
I110-ORD-SEC-NUM,
" PROGRAM STOPPED."
DELIMITED BY SIZE INTO W100-GLOBAL-ERROR-AREA;
GO TO Z999-FATAL-ERROR-EXIT.
```

```
D5380-SET-INVOICE-FLAG-EXIT.
EXIT.
```

Figure 2: An excerpt from an IS section including large sections of new code.

existing modules and the functionality that needed to be added. As they acquired knowledge, they documented their work in narratives and in hierarchy charts. These documents were put into the project folder for each module of the system. As they resolved issues and made design decisions about what changes needed to be made, they documented these and put them into the folder as well.

Important Inspections

After a few sections of the IS were completed, we held software inspections on

the modules. Members of each inspection team were given the IS section, as well as the original source code for the module if applicable.

Following HP's standard inspection process, reviewers checked the modules for conformance to the IS format and for omissions and errors. This was a critical step because we were able to detect

many problems during these sessions. Programmers frequently noted changes directly on the hard copies of the inspection materials, rather than changing the Memomaker files themselves. This cut down on the time needed to correct simple errors. Changes and inspection results were kept in the project folders for reference during construction.

CHECKLIST FOR A SUCCESSFUL IS PHASE

- Go to more detail than you may be used to in your IS document. If you do not get down to the logic specifications, the screen and report layouts and the file and copylib contents, you may not receive much payoff from writing your IS.

- Hold software inspections on each section as it is completed. This is a critical step.

- Don't write an elegant, formal document. Use simple file editors, and write directly on listings of existing code if this is more convenient. Don't make it pretty, make it useable!

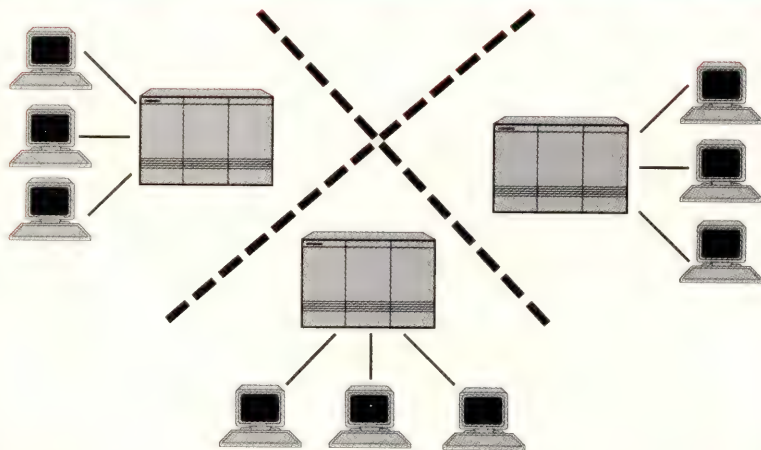
- Use project folders to track inspection results, changes in design, etc. for a given module. It may not make sense to change the original text in your module. Note changes directly on the hardcopy for later reference.

- Keep in mind that it will take you longer to write a detailed IS than it did to write a high-level document. Take this into account in your scheduling. You'll make it up during the construction phase. On our project, the IS took roughly as long as the ES took to complete.

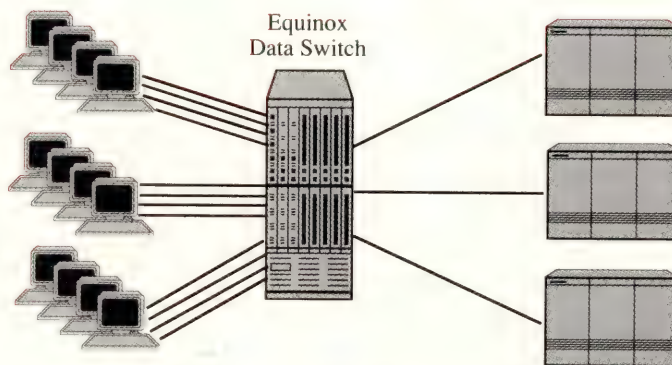
- Keep in mind that software inspections also will take time. Again, our past experience on other projects has shown that the investment will pay for itself by preventing defects, but you must build this into your IS phase schedule.

—Lisa Burns

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IS SECTION WITH CHANGES WRITTEN IN LONG-HAND

Internal Specifications

Display of Local Field Labels on Order Control

Screen: Order Control

Program: OMS2100S

Paragraphs involved: A000-ORDER-DRIVER

Note: Existing paragraphs are only being inspected for changes that directly relate to the configuration of local field labels.

This inspection only covers the loading of the local field labels, not the edits of the local fields themselves.

Overview:

In WWOMS, The Office Parameter Table offers the possibility of configuring the labels for the fields marked "Local1" and "Local2" on the order control screen.

The labels will be loaded into the fields as the order control screen displayed.

Logic Flow:

The desired label configurations are entered via the Office Parameter Table screen. When an office is set up on the parameter table, the field labels will be set to "Local1" and "Local2" if not defined by the user.

Paragraph A000-ORDER-DRIVER initializes screen fields and opens files for access. It also calls paragraph A001-CALL-SUBR, which will retrieve OMSTBL values if they haven't already been retrieved. This paragraph must be modified to move the local field labels from the parameter table dataset to the local labels on the order control screen.

Changes:

- * Before the order control screen is displayed, OMS2100P must load the field label values from the OMSTBL entries called Local1 and Local2 in the PARAMETER-TBL dataset.

The following is paragraph A000-ORDER-DRIVER from OMS2100S, with proposed changes:

<pre> 001000 A000-ORDER-DRIVER. 001100\$IF X0=ON 001200 DISPLAY "A000-ORDER-DRIVER". 001300\$IF 001400 001500 MOVE W000-PROG-VERS TO PROGRAM-NUM 001600 MOVE "A000" TO PARAGRAPH-NUM. 001700 MOVE "100" TO SCREEN-NUM. 001800 001900 MOVE CURRENT-DATE TO W000-CURRENT-DATE. 002000 MOVE CORR W000-CURRENT-DATE TO INTERNAL-DATE. 002100 002200 MOVE SPACE TO W000-HOLD-ERROR-CODE. 002300 PERFORM U020-SHRINK-STACK THRU 002400 U020-EXIT. 002500 002600 MOVE SPACES TO SCREEN-BUFFER. 002700 MOVE W000-PROG-VERS TO V100-PROGVERSION 002800 MOVE "OMS100" TO COM-NFNAME. 002900 MOVE SPACES TO V-MESSAGE 003000* IF SUBFUNCTION: ORDER MAINTENANCE 003100* IS EXECUTED FOR THE FIRST TIME THE SUBROUTINE 003200* FOR INITIALISATION IS CALLED 003300***** 003400 003500 IF W000-FIRST-SUBR-CALL 003600 MOVE "1" TO MENU-FUNCTION 003700 PERFORM A001-CALL-SUBR THRU 003800 A001-EXIT. 003900 004000 PERFORM VIEW-PUTWINDOW THRU 004100 VIEW-PUTWINDOW-EXIT. 004200 004300 IF ERROR-CODE NOT = SPACE 004400 MOVE ERROR-KEY TO ORIG-ERROR-KEY 004500 PERFORM Z900-FATAL THRU 004600 Z900-EXIT. 004700 004800*** DISPLAY ORDER CONTROL SCREEN 004900***** 005000 005100*** SET WINDOW ENHANCEMENT 005200***** 005300 005400 MOVE SPACE TO COM-WINDOW-ENHANCEMENT. 005500 IF V-MESSAGE = SPACE 005600 MOVE ZERO TO WIND-ENHNC 005700 ELSE 005800 MOVE "J" TO WIND-ENHNC. 005900 006000*** TAKE STOP TIME 006100***** 006200 006300 PERFORM U810-STOP-TIME THRU 006400 U810-EXIT. 006500 006600 MOVE DISPLAY-RESULT TO V100-RESPD. 006700 006800 PERFORM VIEW-FORMAT-DISPLAY THRU 006900 VIEW-FORMAT-DISPLAY-EXIT. 007000 007100 IF ERROR-CODE NOT = SPACE 007200 MOVE ERROR-KEY TO ORIG-ERROR-KEY 007300 PERFORM Z900-FATAL THRU 007400 Z900-EXIT. 007500* OPEN OMS DB 007600***** 007700 007800 IF NOT I000-OPEN </pre>	<pre> 007900 008000 PERFORM U025-OPEN-OMS THRU 008100 U025-EXIT. 008200 008300* OPEN OMSHIS 008400***** 008500 008600 IF NOT I000-OMSHIS-OPEN 008700 008800 PERFORM U027-OPEN-OMSHIS THRU 008900 U027-EXIT. 009000 009100* OPEN ORDER KSAM FILE 009200***** 009300 009400 IF NOT K100-OPEN 009500 009600 PERFORM U026-OPEN-KSAM1 THRU 009700 U026-EXIT. 009800 009900 PERFORM U030-UNLOCK-ORDER THRU 010000 U030-EXIT. 010100 010200* OPEN MESSAGE FILE FOR CARGO FAST BATCH 010300***** 010400 010500 OPEN EXTEND OMS2600D. 010600 010700* READ ORDER CONTROL SCREEN 010800***** 010900 011000 PERFORM VIEW-READ-SCREEN THRU 011100 VIEW-READ-SCREEN-EXIT. 011200 011300 IF ERROR-CODE NOT = SPACE 011400 MOVE ERROR-KEY TO ORIG-ERROR-KEY 011500 PERFORM Z900-FATAL THRU 011600 Z900-EXIT. 011700 011800*** TAKE START TIME 011900***** 012000 012100 PERFORM U800-START-TIME THRU 012200 U800-EXIT. 012300 012400 MOVE V100-FUNCTION TO MENU-FUNCTION. 012500 MOVE V100-NEXT-SCREEN TO NEXT-SCREEN. 012600 012700 PERFORM A010-VALIDATE-DATA THRU 012800 A010-EXIT 012900 UNTIL EXITKEY OR QUITKEY OR 013000 MENU-FUNCTION = "E". 013100 013200 IF EXITKEY OR QUITKEY OR MENU-FUNCTION = "E" 013300 PERFORM U030-UNLOCK-ORDER THRU 013400 U030-EXIT. 013500 013600* CLOSE MESSAGE FILE FOR CARGO FAST BATCH 013700***** 013800 013900 CLOSE OMS2600D. 014000\$IF X0=ON 014100 DISPLAY "A000-EXIT". 014200\$IF 014300 GOBACK. 014400\$PAGE 014500 COPY SUBR REPLACING 014600 ==XXXX-CALL-SUBR== 014700 ==XXXX-EXIT== 014800 ==YYYY-SUBR== 014900 ==YYYY-EXIT== </pre>
---	--

MOVE I-610-LOCAL 1 - LABEL.
 MOVE I-610-LOCAL 2 TO
 V 100-LOCAL 2 - LABEL.

Figure 3: An example of an IS section for changes to existing code.

We already have seen the benefits of writing a very detailed Internal Spec. During the inspections of IS sections, we corrected many problems, especially those involving inconsistencies between different modules within our system.

Reviewers who had seen the specifications for several modules realized interface problems and other inconsistencies between modules. We were also able to anticipate and correct technical problems such as interface specifications. Finally, problems in security, business controls and other audit concerns were detected. Correcting these at the design phase was much cheaper than if we already were coding and testing.

Holding inspections was therefore a critical part of the IS — our team feels that the value of writing the detailed specifications would have been lost had we not inspected the modules.

Because of the detail required for each section of the IS document, we also were forced to resolve user issues about how a particular feature was to be implemented because we had to specify the precise coding logic involved. Similarly, we had to reach agreement on the exact edits to be done on a given field. These issues were thus much earlier in the cycle than they would have with a high-level IS approach. We feel that our specifications, if not completely frozen, are at least much more solid than they would have been if we had not resolved these issues before coding. This means much less rework during the construction phase.

Another big benefit to the detailed specifications has been that our support team already has been able to write user documentation for the project. The user guides, training guides and system administration guides already are close to complete.

This would've been impossible on other projects I've been associated with, because the details of edits and functionality specifics wouldn't have been available until the code was written. We are confident that our documentation and training will be top notch because the documentation and training developers will have much more time to refine the materials.

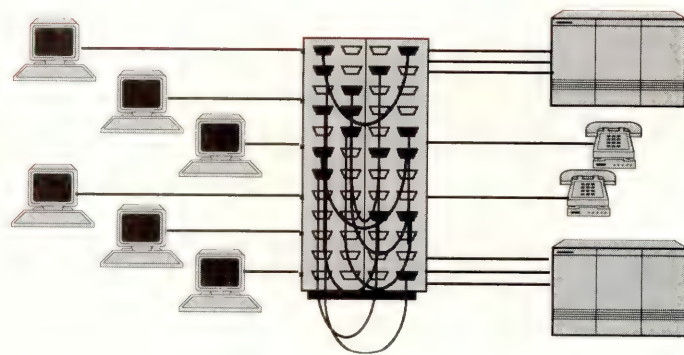
Because the knowledge about the analysis and design of each module was documented, we've been able to handle some project team turnover without a major impact on our schedule.

For example, one of our team members now is working for HP in her native India. Because the decisions made

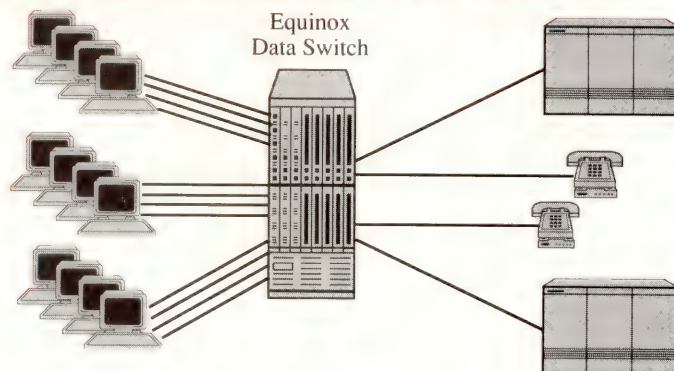
and changes needed for the pricing modules were in the pricing project folder instead of just inside her head, we were able to move forward with this important module instead of starting over.

A final benefit we saw during the IS phase was the production of an accurate database layout. The layout allows us to

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CIRCLE 166 ON READER CARD

define database buffers and copylib members very accurately during construction. In addition, other project teams who read our existing database will have considerably more time to adjust to the new schema than they would've if it hadn't been defined until the middle of the construction phase.

Final Analysis

In the coding and unit testing phase of our project, we see the detailed IS work pay off. Specifically, coding of each module has gone quickly. We also have been able to "farm out" some tasks to resources on loan to our team. Without detailed specifications, we would've had a much harder time working with new and on-loan resources.

As the coding phase progresses, we anticipate other benefits. We expect to find fewer errors in our modules because of the defects detected during inspections of each IS module. We expect much less rework, because we removed inconsistencies and technical problems from our specifications before we began coding. Overall, we expect many fewer "surprises" than are usually encountered during construction.

Following the completion of our IS phase, as we have done with other phases, we held a review meeting to discuss what went well and what did not go so well during this phase.

The team was overwhelmingly enthusiastic about our IS format and process. We quickly realized that if we had not gone to such detail in the document, we would've been coding until 1999.

We are very happy with our IS. The team is sold on the idea, and we plan to continue this practice for future enhancements to our new system. We have already seen the benefits of our work now that we are coding and testing. Writing software is never a dream, but this approach certainly avoided the nightmare. I hope you experience similar benefits on your next maintenance project! — *Lisa Burns is an OMS System Manager for Hewlett-Packard, Palo Alto, CA.*

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CIRCLE 118 ON READER CARD

"We've received a lot more responses, the leads we're getting are of a better quality and I'm very happy with the percentage we're turning over"

**Art King
HP 3000 Business Manager
SOTAS International Inc.**

For SOTAS, HP Professional Means More and Better Leads

SOTAS International Inc. is a leading provider of premium accounting solutions for the HP 3000 market, with more than 650 applications installed worldwide.

What does HP Professional give SOTAS that other publications don't?

"There are a lot of little things HP Pro does to help us out," says Art King. "When you get an HP Pro lead, you get a whole sheet, with all the site demographics broken out in an easy-to-understand format. When you're trying to follow up on leads, it's nice to have that information going in."

"Because our HP Pro leads are prequalified," continues King, "we know whether the prospect should get an immediate response. HP Pro also makes follow through easier by putting blank call sheets that you can use as turnaround documents on the back of lead sheets. No one else puts together all this data and no one else provides lead sheets."

"We started with a 6 time run in HP Professional and a 12 time run in another publication, but based on the results we were getting, we flip-flopped that around. Now we're on a 12 time run with HP Pro."

Are there any other HP services SOTAS finds useful?

Art King says yes. "When we need a [direct mail] list, we just call HP Pro and say 'This is what I'm looking for in terms of a breakdown.' They come back with a very specific list and we know it's targeted directly to HP users."

"I guess it all boils down to this. They listen. They give you a lot of personalized assistance without your having to ask."

"The most important things we've always stressed are service and attention to detail. We have an excellent relationship with HP Professional because they're oriented the same way we are. We know we can count on them for service and attention to detail."

HP Professional

A

MODICUM OF DECORUM

OSF's Decision Could End System Network Blues

Got those big-company network blues? Are you one of those folks that gets to make the bits and bytes leap joyfully from the PC on your desk to the LAN (local area network), to the WAN (wide area network) to the GAN (galactic area network)? Ever notice how much fun it can be to remember all the cute little key sequences you need to make this happen? And how few applications exist that take effective advantage of the full potential of networking? Does that sound a little familiar?

Well, cheer up! Help is on the way. Networking is about to move 'round the bend from the chewing gum and bailing-wire days into something stronger and more reliable that will provide a lot more capability.

Some skepticism is in order. Remember Sun's "The Network is the Computer"? Not quite yet it isn't. And IBM's "The Year of the Network" was some time back, and we're still waiting. HP also gets periodically excited about some great new networking thing (GNNT), and generally, the GNNT boils down to some arcane widget that's part of the solution for a certain problem that you may or may not have. So don't hold your breath yet — these things take time.

All criticism aside, the fact is that several large computer companies are excited enough about this particular GNNT that they cooperated in putting a team of engineers onto it, melded several existing technologies and came up with a better name than GNNT. The generic name for this new type of product is distributed computing environment (DCE), and they are gearing up to deliver a DCE to you.

"Whazzzat?" you ask, fearing the very worst.

Distributed Computing Environment

When you sit before your computer and flick on the power, you know that your particular system will come up in a way that you have grown to know, if not love. When you program, retrieve or store data, each process takes

place in a fashion typical of the system you use.

Networking now has reached a stage where it's possible to share files, data, programming and computation among a large assembly of different computers that function in different ways. In order to extend this capability as far as possible, the industry must develop standard methods for handling networking tasks, just as it has developed standards for standalone systems.

Distributed computing is a system that allows the entire network to function as one large computer, without asking any additional knowledge or effort from the user.

Some standard networking services exist, but those necessary to implement a true distributed computing environment differ from vendor to vendor. Right now, HP has its methods for data sharing and remote procedure call, for instance, which differ from those used by Digital, which differ from those at IBM, which differ from those used at Sun, and so on.

Realizing this, vendors began to discuss the possibility of developing standard systems for networks. Last summer, the Open Software Foundation (OSF) issued a request for technology, asking vendors to propose a distributed computing environment or software that might provide some of the services for such an environment.

Johnathan Gossels, business area manager for interoperability at OSF, says that while networks are quite common now, "The sad fact is that people are not getting much out of them. There are not many distributed applications. What this program is all about is providing to the industry a set of integrated technologies that will make it easier to create, use and maintain applications on distributed systems."

One of the goals for a DCE is to make it as easy to write applications for a distributed environment as it is to write them for individual computers. If you're a programmer trying to write a network-based stock-trading program today, says Gossels, "You must be an expert in



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stock trading, programming and network technology as well. It is very expensive for companies to develop this kind of software." Using a DCE, he says, you don't have to worry about having all that expertise in one place because the software separates them.

At the other end of the line, the user will see significant benefits in a DCE as well, says Gossels. "Many users will have capabilities that they didn't have before, such as remote procedure call, networked file systems, diskless applications and network-based security. This type of power available as part of the infrastructure is vastly different from anything they've had before. It will take time to learn to use the power we will provide, but over time it will make a tremendous difference."

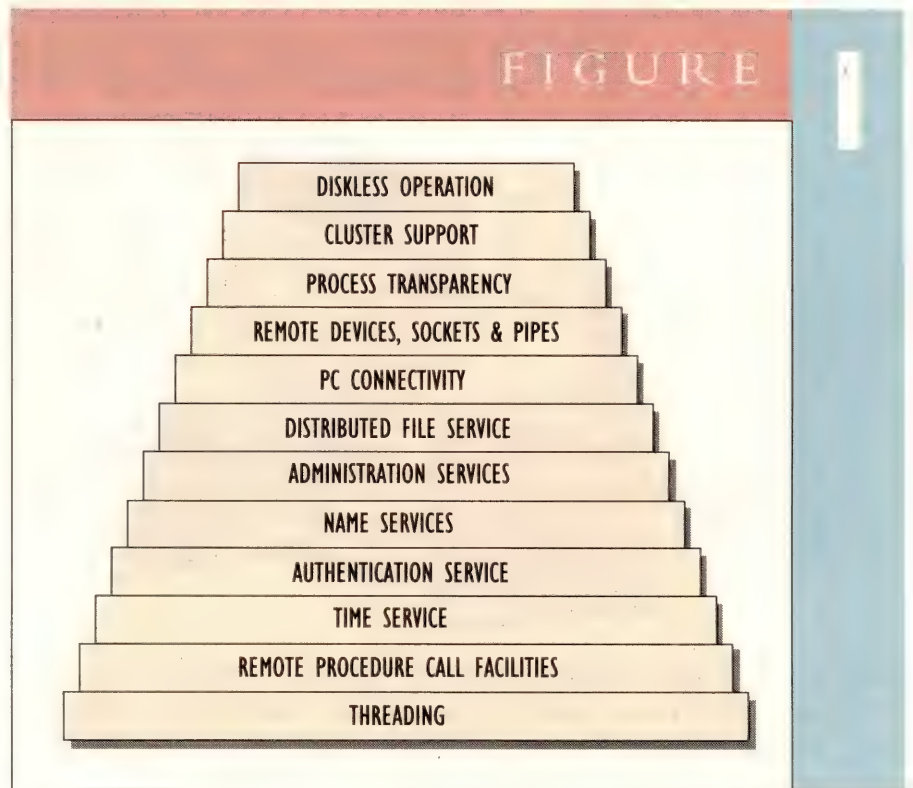
Perhaps the best thing about your use of these network services is that, properly set up, you will never even know they are there. The processes will be "transparent" to you.

Enter DEcorum

Even before HP and Apollo combined their computing teams, many in the industry had high opinions of Apollo's network computing system (NCS). It was a natural to become a core piece of any distributed environment. In response to OSF's request for technology, HP's Apollo Systems Division teamed with IBM, Locus Computing, Transarc, DEC and Microsoft in a joint proposal that the group named DEcorum.

DEcorum was far from the only proposal sent to OSF in response to the RFT, however. Gossels says OSF has 50 submissions, including several comprehensive proposals like DEcorum. One of the other large proposals came from a group of Unix International members including AT&T, Sun Microsystems, Novell and Netwise. This group proposed a system built around Sun's Open Network Computing (ONC) and Netwise's TOOLS. Sun's Network File Service (NFS) is part of this proposal.

OSF was expected to make its choice of a proposed standard known by mid-May. However, at this time, OSF had given no indication of the direction of



The major components of DEcorum were designed to be independent layers that could be flexibly and efficiently built into a complete distributed computing environment.

its thinking. OSF is free to adopt one of the proposals in its entirety, or take the best pieces from several and build one distributed computing environment from them.

While the final outcome of the OSF decision is uncertain as yet, it's clear that some kind of industry standard distributed computing environment is about to appear, and that it will have a lot of influence on how your network operates in the future.

Inside DEcorum

Naturally, HP hopes DEcorum will be adopted unchanged by OSF. Just as naturally, Sun and others with their own proposals want theirs to be chosen. There is enough similarity in concept, however, that learning about DEcorum may help you get more comfortable with what's ahead, whichever the precise form it takes.

The DEcorum group did not reinvent any wheels. They took existing, proven technologies from participating firms and combined them to form the end product. Fortunately, DEcorum does not sim-

ply take some proven code and toss it together at the user. The software is organized into five functional areas including services, data sharing, compute sharing, distributed programming/RPC and system administration.

Services include authentication for security, time synchronization, name service, attribute broker and thread-processing capability. Authorization and authentication security services are based on the MIT Kerberos model, and time service is based on the Network Time Protocol (NTP) standard. A directory and name service using the NCA model and NCS interfaces. Threading facilities facilitate servers implementation.

Data sharing includes distributed file system, administrative tools, PC integration and diskless operation. The distributed file system is based on Transarc Corp.'s AFS (formerly the Andrew File System of Carnegie Mellon University), with TCF extensions, PC and UNIX file integration and compatibility with Sun's NFS. PC and UNIX connectivity services

are based on the HP/Microsoft LAN Manager.

Compute sharing includes clustered operation, remote processing, process migration, remote special files and hidden directories. Cluster-based computing is based on AIX/TCF technology. Process transparency is provided by IBM's Advanced Interactive Executive (AIX) Transparent Computing Facility (TCF), jointly developed by IBM and Locus.

Distributed programming and remote procedure call includes RPC and presentation service. Remote procedure call (RPC) uses Network Computing Architecture (NCA) and Network Computing System (NCS) protocols. This was jointly developed by HP's Apollo Systems Division and Digital.

System administration includes account administration, network administration, active site and user status and file system management.

When pulling together various parts of the proposal, the DEcorum group had the wisdom not to design the animal entirely by committee. On the engineering side, IBM took the lead, working with technical people at the various firms and providing the glue to bring it together. HP led the business side, working out the complex cross-licensing issues with participating firms and OSF.

DEcorum clearly has made an impression. In assembling a January 1990 newsletter on distributed computing environments, Patricia Seybold's Office Computing Group used DEcorum as the only detailed example.

HP's Ron Vernon, DEcorum's business manager, says DEcorum will function on everything from IBM mainframes to UNIX and VMS workstations to PCs. And while the DEcorum group didn't choose to use Sun's NFS as part of the proposal, Vernon says they have been careful to give enough thought to NFS that both it and DEcorum can be used together.

Mark Lederhos of HP's Apollo Systems Division notes that, "Five years ago it would have been unheard of to have these companies working together to add value for their customers. But these networks are becoming so global that piece-

meal solutions won't cut it anymore."

So HP and its DEcorum partners await the OSF decision. And what if... OSF chooses some proposal other than DEcorum? Says Vernon, "Obviously, we'd hate to see that, but we as well as the other members are committed to following OSF. If something else is chosen,

we will follow that, and we would form a migration plan to execute it."

So the next time you feel those big-system network blues coming on, don't lose heart. Help is on the way.

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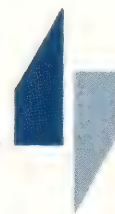
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The 4045 comes standard with Centronics parallel, RS-232C and Dataproducts 2260 serial interfaces and can be configured to work with HP and DEC hosts, as well as IBM PCs and compatibles. The 4045 supports ASCII, ISO, EBCDIC and IBM PC coding schemes. Interface hardware is available from Xerox that lets your model 150 operate in an IBM Sys-

tem 34/36/38 environment or in an IBM 3270/SNA configuration. Part of the interface controller's function is emulation of the IBM printer standard for the applicable environment.

The standard version of the 4045 supports two emulation modes: Xerox 2700 and Diablo 630. The 2700 is a laser printer. The 630 is a daisywheel-type impact printer. A subset of the Diablo's Extended Character Set/All Purpose Interface (ECS/API) configuration is supported. However, not all of the 630 functions are supported — a result of the difference between mechanical and electronic printing methods.



Barry Sobel

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CIRCLE 152 ON READER CARD

The Laser 4045 is configured by means of a removable configuration cartridge composed of four switch banks labeled A through D, each containing eight switches. The switches let you set up the printer for parallel or serial operation and set the emulation mode, baud rate, data flow control, the default printer font and other control options so that the 4045 works with your host system.

Three suggested default settings are provided in the documentation set for the printer: parallel Centronics, parallel Dataproducts and serial asynchronous. The RS-232C serial port on the Laser CP is configured as data terminal equipment (DTE). This means that because your host port probably is set up the same way, you'll need a null-modem cable, i.e., one in which pins 2 and 3 and optionally pins 6 and 20 are crossed. Alternatively, you can use a straight-through cable and a modem eliminator adapter, available at most computer and electronics stores.

Specifications

The 4045 is billed as a compact printer. It's 19.5 x 40.5 inches, including the optional receiving tray. This compares with 20.8 x 25 inches for a DEC LN03A and 18 x 32.1 inches for an HP LaserJet Series II. Additional space is needed around the printer to provide adequate ventilation.

The 4045 prints at a speed of 10 pages per minute. It's rated for use at 15,000 pages per month. Graphics can be printed with a resolution of 300 dpi.

The 4045 uses an Intel 80186 microprocessor. It comes standard with 1 MB of RAM and is expandable to 2 MB for use with desktop publishing packages such as Xerox Desktop Publishing Series from Ventura Publisher.

The Laser CP can use fonts from four sources. There are two resident internal fonts: Titan10iso-P for portrait orientation and XCP14iso-L for landscape printing. Font cartridges are available with several fonts to a cartridge. You also can download fonts from tape or disk from your host system.

Also available are "personality" car-

tridges to emulate the HP LaserJet Plus/500 Plus and the Epson FX80/100 dot-matrix printer. Raster-to-graphics conversion is possible using the X-Graph cartridge, which enables acceptance of vector commands from applications such as SAS Institute's SAS/Graph and Autodesk's AutoCAD.

Information about the printer's operation can be found on the 4045's control panel. There are indicators for conditions such as Add Paper, Add Dry Imager (toner) and Clear Paper Path. There are switches for Reset, Offline and Last Page. One difference from other printers is that the LED next to the Offline switch lights when the printer is offline, not online. A two-digit display provides status codes that can help diagnose possible printing problems.

Performance

We tested the printer on many documents of various formats and length. They printed as expected, based on the configuration choices we made. To avoid jamming, it's important that you fan the paper and load it with the curl side up. The Xerox 4045 prints on plain, pre-drilled and letterhead paper, preprinted

forms, labels, transparencies and xerographic envelopes.

The 4045 has four cartridge slots next to the configuration cartridge slot available for font cartridges. Setting switch B:7 on the configuration cartridge on, you tell the printer to use the first font in the font cartridge you've installed in the first slot to the right of the configuration cartridge as the default font. Setting switches B:7 and B:8 on will select the first font in the second slot to the right as the default font. There's no provision for selecting fonts from cartridges in the third and fourth cartridge slots as the defaults.

Considering that the 4045 is from Xerox, it isn't surprising that the tested model came with the copier option. There's a standard automatic-feed copier on top of the printer that copies originals from 3 x 5 inches to 8 1/2 x 14 inches. The copier won't function simultaneously with the printer in operation (indicated by PLEASE WAIT on the control panel). You must wait for the READY light, which appears after printing stops. We tested this option and it worked smoothly, producing quality copies.

You can purchase an optional feeder/stacker from Xerox that allows you to print up to 750 sheets before reloading. Other options include additional font memory and IBM interface hardware.

Summary

The Xerox 4045 Laser CP is worth considering for your laser printer of choice, especially if you're in a multivendor environment.

Xerox 4045 Laser CP Model 150

PLATFORMS: Any host system using RS-232C, Centronics 100 or Dataproducts 2260 interface; optional interface hardware available for IBM mainframes

PRICE: From \$4,995 to \$6,695, depending on options; IBM interface hardware additional

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CIRCLE 299 ON READER CARD

Recently, Xerox introduced its 4045 Laser CP Model 160 for low-volume users in a shared environment, to be used as a distributed systems printer, or in a LAN, mainframe or minicomputer environment. It has the ability to switch between different emulations and page description languages (PDLs) through software commands. The two-page description languages, the Xerox Interpress language and an emulation of the Postscript language, provide greater graphics and text capabilities.

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CIRCLE 182 ON READER CARD

HI-COMP's Answer For Backup And Recovery



Perhaps the least rewarding function regularly performed by a computer operations group is the boring and inconvenient task of backing up the system's disc files.

Until a few years ago, all HP 3000 shops had only one insurance carrier, the standard system functions SYSDUMP and STORE.

These functions have had three very powerful arguments in their favor: They were written by HP. They are supported by HP. And they are free! Beyond that, they do the job and have some convenient features such as indirect files, etc.

But both SYSDUMP and STORE are limited in their capabilities when contrasted with the backup and recovery software available on personal computers through third-party vendors.

One HP 3000 software vendor to recognize this is HI-COMP with its HIBACK backup and recovery software for HP minicomputers running MPE V, MPE XL or HP-UX.

Features

HIBACK has a number of time and cost-saving advantages over the standard system utilities. Files can be stored to disc



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FROM THE LAB

and tape, on-the-fly compression of the stored files is available (and very effective), database backups can be performed concurrently with user access to the files being backed up, and backup volumes can be appended to previous backups on the same reel. What this means in "real life" is reduced backup time, reduced cost and improved service to your users.

HIBACK maintains the features of the STORE command that are most useful, such as indirect files and restoring to non-local groups or accounts. It also addresses the shortcomings of STORE that are most annoying, such as the inability to print a directory of files on the backup volume or to perform all of the functions of a DBSTORE.

There also are a number of lesser items supported by this backup utility including labeled or unlabeled tapes, archiving (or purge after storing), full database backup with resetting of the database store flag (as done by MPE's DBSTORE but not by STORE) and network backups.

A special version of HIBACK is also available for HP-UX.

Installation And Set-Up

Installation of HIBACK was straightforward, though a bit more work than I expected.

While most vendors provide a jobstream to perform the installation, you must manually create the HICOMP account, associated groups and users before restoring the HIBACK files from tape. These steps are a very minor task, and will add at most a couple of minutes to the installation time. When the restore is completed, the HIBACK program and four other supporting files, including an online manual, will have been restored.

Editor's Note: HI-COMP's newest version (5.22.0F) includes a program that automatically creates the test accounts.

Test Results

For my test I created a number of jobstreams to perform backups to tape, restores from tape, listings of tape directories and backups and restores to and from disc. My test files included standard text files, databases and a hodgepodge of odd

file types. A sample of a backup jobstream follows:

```
!JOB STORE711.MANAGER.SYS.PUB
!COMMENT
!COMMENT Backup the DA database to tape:
!COMMENT Allow access to the
!COMMENT database during backup (MODE
!COMMENT SHARED), write over
!COMMENT the existing volume set ("NEW
!COMMENT VOLUMESET" response of
!COMMENT "N") and store all database
!COMMENT files if the root file
!COMMENT has been modified ("STORE IF
!COMMENT MODIFIED" response of "Y").
!COMMENT
!RUN HIBACKD.PUB.HICOMP
DA@.DATABASE.DEVEL
MODE
SHARED
STORE
TAPE
N
Y
!EOJ
```

Among the first things you notice about HIBACK is that the program is prompt-and-response driven much like SYSDUMP. The prompts will differ depending upon the function (STORE, RESTORE, DIRECTRESTORE, etc.) chosen. HIBACK also provides a MODE function to change or view the options being used, such as data compression or the list device for the store or restore.

In the preceding example I have used the MODE function to request that the store use "SHARED" mode to provide concurrent user access to the files during the backup. Online HELP is also available as a function. The prompt and response approach can be convenient when using HIBACK interactively, but you may need a few tries to establish the correct sequence of commands if you are storing or restoring from a batch jobstream.

After storing files to tape and to disc, I performed restores to a different group (using the MODE function and the NON-LOCAL option) and used FCOPY to compare the restored files with their source files. All of the jobstreams and functions performed without significant problems, though it often took me two or more attempts to get the job syntax or command sequence correct.

The most impressive feature of HIBACK was its ability to store a compressed backup to disc. (HIBACK creates a backup volume or file not unlike many PC backup systems.) The backup volume

I created was only 30 percent of the size of the files I stored! I restored this backup to another group and performed comparisons between the files to convince myself that all files were included in the backup and were intact, and they were. Had I chosen to, I could have then backed up the backup file (volume) to tape using HIBACK.

Ease Of Use

HIBACK isn't difficult to use but could be friendlier. The use of command strings, (e.g. MODE=COMPRESS,SHARED,FULL) would be an improvement over the SYSDUMP-like method.

I was more uncomfortable with the prompt and response approach when performing restores and direct restores than when storing. (With a restore you are prompted for "WHICH DATABASE/FILESET?" and then later prompted for "WHICH FILES?". The meaning of the prompts is similar but not identical.)

HIBACK supports command files, but lacks a facility to create them from the responses given during an interactive session. Indenting at the different levels of prompting also would be of some benefit, albeit minor. In trying to emulate the

MPE SYSDUMP function the folks at HICOMP have emulated some of its less desirable conventions.

Summary

If you are currently using MPE's SYSDUMP and STORE facilities for back-

ing up you will be favorably impressed by the expanded features of HIBACK. In operation it's too much like SYSDUMP to get very great marks for its user interface, but HIBACK is extremely flexible, very reliable and could save you significant time and money. ■

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PC TIPS

Miles B. Kehoe

your Vectra using the CONFIG.SYS and AUTOEXEC.BAT files, and some of the commands you can take advantage of during this process. You'll probably find the management of your setup an ongoing task, and one you'll want to review every few months as you add new software to your system.

Now, I want to start your move into the future. The next few columns will be about Microsoft Windows and how you can take advantage of this emerging standard interface. Later, I'll tell you about HP's NewWave environment and what that will do to take you into the future of computing.

The Basics

Traditionally, the primary interface to MS-DOS has been the character-based command line interpreter. In English, this means the familiar "C>" prompt.

In the forefront of improving the ease of use, Hewlett-Packard was among the first to introduce an improved character interface with the introduction of PAM in 1984. HP has improved PAM through the years, mostly by enhancing memory use and the process of installing applications. However, PAM was unique to HP PCs, and the industry was making its own attempts to improve the user interface.

In 1984, Microsoft proposed a Graphical User Interface (GUI) as a standard "virtual system." Using many of the features introduced with the original Xerox Star system in the 1970s, Microsoft Windows was designed to offer a standard interface to users while offering a universal system to program developers.

Back then, there were a number of MS-DOS-based computers with Intel

Windows Is Evolving As The Standard GUI

A Look To The Future

processors, but not all were software-compatible with other MS-DOS systems. Developers for the IBM PC didn't always use MS-DOS standard functions as they programmed their applications. In fact, most of the better programs used features unique to the IBM ROM BIOS to enhance performance. This meant that products like the HP 150 ran standard MS-DOS but couldn't run popular software.

Microsoft proposed Windows as the solution to the problem: If a hardware developer wrote the machine-specific code for Windows, and if application developers used only Windows' routines, then a program written for one computer could run on any Windows-based system. To the application program, Windows was the system.

Unfortunately, before Microsoft turned Windows into a suitable standard, the nature of the industry changed. Now there is virtually no MS-DOS-based system on the market that is not ROM BIOS compatible with the IBM PC. The "virtual system" is the ROM BIOS.

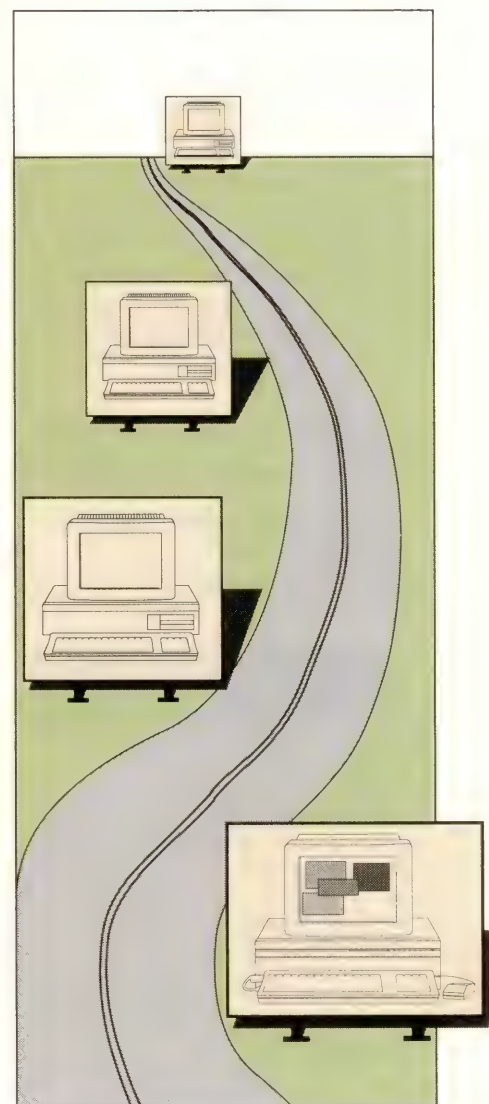
However, regardless of this standard, MS-DOS still is based on a character-based interface, and Windows is evolving into the standard GUI for the Vectra and other IBM compatibles. It seems that Windows will be the interface all of us will be using in the coming years.

The Hardware

Reflecting the extra work the computer must do to drive a powerful GUI, you may find that your old computer just doesn't make sense any more. To be really productive with Windows, you'll need at least a 286-based machine, and the higher the speed the better you'll like it. In fact, if you're thinking of buying a new system to use Windows, I wouldn't even bother with a 286. Go all the way to a 386 or 486 Vectra.

To go along with your high-speed processor, you'll want memory. Lots of memory. For Windows only, 640K will do. But if you want to do many things, or add NewWave, add up to 6 MB of high-speed RAM. A good GUI doesn't come cheap! Stick with the Vectra for the base system, but find a good LIM 4.0 expanded memory card to save money.

Windows requires a high-resolution





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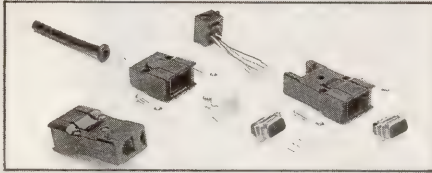
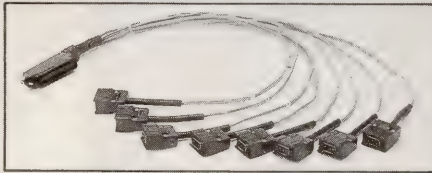
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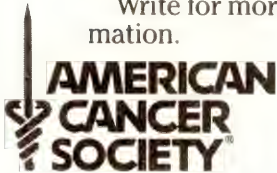
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display as well: EGA is acceptable, but again, the better resolution and speed of a VGA is better still. In addition, Windows requires a mouse or other suitable pointing device. If you're using an HP-HIL interface, be sure to purchase Windows from HP. If you are using a standard mouse, you can buy the "off the shelf" Windows from a local dealer.

Finally, all this power needs disc storage. Technically, you can run Windows on a floppy disc-based PC. However, you don't want to do it. I'd suggest a minimum of 20 MB of hard disc. In fact, 40 MB is more like it.

A few years ago I heard a product manager at Microsoft lament the company's decision to provide the Windows development team with high-powered PCs. He reflected that, had the developers been given CGA-based 8088 systems with small disc drives, Windows would be a lot better on less expensive systems. As it was, the developers had fast, high-powered EGA-based systems. Now Windows isn't acceptable unless you have a similar system.

The Software

Now that Windows is gaining acceptance, more and more developers are introducing Windows-based versions of their programs. This is because, as a virtual system, any application is either a "Windows Application" or a "DOS Application." It is this duality that contributes to some of the difficulty in getting applications running.

Once you have Windows running, you can start an application written specifically for Windows by highlighting it with the mouse and either clicking the mouse buttons or pressing the [ENTER] key.

If an application is not written specifically for Windows, you have to provide information about what resources the application will need. This is done by storing the information in a file called a "PIF" file. Microsoft provides a number of PIF files with Windows: Many vendors are now providing a PIF file for their non-Windows application.

You can create your own PIF files using a utility called PIFEDIT: This is one of

the programs you receive when you purchase Windows.

Moving Around

Once you have installed and started Windows, you will see a list of all the files in the Windows directory. Some of these files are programs, and some are data files for Windows and for the Windows applications.

I have a directory called EXEC in my primary Windows directory, and that is where I store the executable files for my Windows applications. For simplicity, I also store all the PIF files for my non-Windows applications in the same directory. You might want to do the same inside your Windows directory.

You can do this by creating the directory in Windows and copying all the .EXE files into the new directory. As you create new PIF files, save them in the same directory. Then, when you run Windows, execute it from a batch file and specify this new directory as the current directory. This batch file in my system follows:

```
@echo off
PATH=%PATH%;D:\WIN286;
CD D:\WIN286\EXEC
D:\WIN286\WIN
CD C:\;
ECHO End of Windows/286
```

This file lets me see only my executable files when I start Windows: I prefer that to facing a screen full of mixed files and programs. You may find it preferable, too.

Looking Ahead

Next month we'll go over the process of creating a PIF file for your applications. There are several elements you'll need to know about an application, and I'll cover them here. I'll also go over ways to customize Windows, from changing the colors you see on the screen to adding new printers and fonts. —Miles B. Kehoe is an online support manager for Verity, Inc., Mountain View, CA.

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UNIX

Andy Feibus

What Is UNIX, Really?

Editor's Note: This column's name change reflects the new reality in the HP marketplace that HP-UX is not the only version of UNIX available.

Whenever I've sat through a presentation concerning UNIX systems, I hear "the more memory you have the better." Unfortunately, the explanations I've heard as to "Why?" usually have been restricted to a litany of technical buzzwords like *virtual memory*, *swap space* and *cache*.

These buzzwords might be fine for the technical computer wizard, but all it means to people unfamiliar with operating system theory is, "Ask a dumb question, get a confusing answer." But, the question isn't dumb. And the answer doesn't need to be so confusing. UNIX is a *virtual memory operating system*. The principle behind a virtual memory operating system is that only a small amount of memory is being used at any time by a user's program. In other words, only a small section of the code is executed at any time and this code references only a small section of the program's data.

A virtual memory operating system loads into the system's physical memory (RAM) only those sections of code and data that are being executed or referenced at a particular moment. The rest of the program and data area is stored on a section of the user's disc known as the *swap space*.

The swap space initially is configured when the disc is installed, and must be larger than the memory requirements for all programs to be running at any given time. For example, if programs **AB**, **BD** and **DC** are expected to be running at the same time, then the swap space

must be configured large enough to store the combined code and data areas for **AB**, **BD** and **DC**.

When a program initially is loaded (and before the program begins to execute), the program's initial memory requirements (for code and data) are reserved in the swap space and the contents of the program file are copied to the swap space. When the program begins executing, the program's initial sections

T*he more physical memory you have installed in your system, the less swapping your programs will require.*

of code and data are copied from the swap space to the system's physical memory. This transference is called *paging*, because the information is copied in chunks of memory called pages (usually between 512 bytes and 8,192 bytes of code or data). The transference also is known as *swapping*.

As a program dynamically requests more memory from the system (e.g., using the **malloc(3)** library routine), more swap space is allocated to the program.

When a program needs a section of code or data that isn't in physical memory, the kernel transfers the required section of code or data into physical memory. Once physical memory is completely full (no RAM is available for receiving the requested page), the kernel must remove (or *swap out*) one or more pages from memory to accommodate the request.

The kernel now must decide which page or pages to remove from physical

memory. Usually, the page (or pages) that was (were) least recently used by any program executing in the system is chosen for removal. This algorithm is the most efficient for the average program that's executed.

If any part of the page has been changed (e.g., the page contained data that's been modified), the page is copied back to the swap space. The kernel then loads the requested page into physical memory.

Conclusion: The more physical memory you have installed in your system, the less swapping your programs will require. Swapping is time consuming: Each swap can require as little as 30 milliseconds or more than one second (depending on how much swapping must be performed to accommodate the request and the speed of your swap disc).

Another twist to this scenario is that some programs can lock themselves into memory and prevent the program or any portion of the program's data area from being swapped out. Usually, these programs must run as quickly as possible. The kernel programs, for example, are locked into memory (because if the kernel was swapped out, it would be unable to execute any requests).

To lock a program into memory, use the **plock(2)** and **datalock(3)** subroutines. Some system restrictions may apply as to which users may start programs that use these subroutines. Refer to the descriptions for these subroutines in the *HP-UX Reference Manual*.

Memory management within a UNIX system is also responsible for mapping a program's memory requests to the physical memory available. This is why the scheme is referred to as "virtual memory." The program, when it's compiled and linked, assumes that it will be the

only program running in the system and that it will be loaded at address 0. Because this is not the case, the kernel is responsible for assisting the system to provide a way to map each memory request to the appropriate location in physical memory.

For example, a program may have 1 MB of code and require 20 MB of data. When the program is loaded, at least 21 MB of swap space must be reserved for this program. If not enough swap space is available, the program is aborted with an error.

If enough swap space is available, the required swap space is reserved for this program and the first page of the program is paged into physical memory.

The mapping of an address occurs, for example, when the program references its variable **qd**. This variable may be located in the program's "virtual address" of 0x1294. However, the page containing this variable may have been loaded into

the physical memory so that the variable is really located at 0x381034. When a request is made by this program for the variable at address 0x1294, the address automatically will be remapped to 0x381034.

The maximum size of a program's virtual space usually is limited by the kernel (defined at installation time) and the addressing capabilities of the system. However, because all code and data used by the program must be reserved in the swap space while the program executes, the true limiter for the size of a program is the size of the system's swap space.

Conclusion: If you have big programs to execute, create a large swap area and make sure it is on your fastest disc.

Very Fast Physical Memory

Studies of programs have shown that most programs reference data and instructions within only a small section of each page loaded at any time (because the

program doesn't execute much before being interrupted). To take advantage of this fact, a *cache* is used. A cache is a block of very fast physical memory. When the system wants to execute a section of code, this code is copied (from a page of RAM) into the system's instruction cache (usually a very small block of less than 1,024 bytes), where the system can execute the code much faster than when the code is in the system's normal (slower) physical memory. Cache memory, because of its speed, is more expensive than normal memory, so much less cache is available on the average system than normal memory. The concept of a data cache (for providing fast access to sections of the program's data) is also used in some systems.

Hope it's less mystical. — *Andy Feibus*
is president of *Processware Inc.*, Atlanta, GA.

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RDBMS

Fabian Pascal

Examine The Relational Capabilities Of The DBMS

Relational Data Access

One of the basic fidelity rules (Rule 5) requires a comprehensive data language. Such a language must correctly exploit all relational capabilities of the DBMS, one of which is relational access to the data.

Guaranteed Access

Users, through their applications, instruct the DBMS to operate on data logically by means of a data language. The DBMS must access the physical data. User specifications, in terms of the familiar content of the data and without reference to irrelevant internals, must be sufficient for the DBMS to access the data on disk. Rule 2 specifies what type of user ID guarantees this for relational access.

- Each and every data value in a relational database must be
 - guaranteed to be
 - logically accessible
- by resorting to a combination of
- table name
 - column name
 - primary key value.

Every data value in any table is identifiable by the table name, column name and row. Rule 2 ensures that the same applies to tables computerized in relational databases. In fact, it requires one of the properties that makes database tables R-tables: unique rows. By insisting that each table must have a DBMS-supported primary key (PK), the rule ensures row uniqueness and guarantees logical access to each and every data value in the database. Note that PKs are a structural feature of the relational model and, as Figure 1 shows, compliance with Rule 2 requires DBMS support of such features. This is an example of interdependency between rules and features.

Physical Data Independence

Relational DBMSs present data to users as tables. Users refer to the data in databases logically, only by table name, column name and PK value. But, internally the data is stored by the DBMS as bits and bytes in clusters, B-trees, VSAM and ISAM structures, etc. Data values are assigned disk addresses that the DBMS must rely on to access the data, using various physical techniques such as indexing, hashing, clustering, etc.

Such physical mechanisms are irrelevant to users and difficult for them to handle. Moreover, each of them tends to maximize efficiency of disk access for specific data configurations and operations, but not others. Therefore, with databases that are dynamic in terms of data structure, volume or operations, the

DBMS must use different disk storage structures and access strategies for different users/purposes and at different times to ensure efficiency.

Explicit reference to them shouldn't be necessary for users in applications, because they impose an unnecessary and impossible development and maintenance burden. If internal details are *explicitly* referred to in queries or programs operating on databases, any change will invalidate those queries and programs.

Deciding which of the available internal mechanisms is best for each application and under what circumstances is an impossible job for users, especially because it always requires up-to-date descriptive and statistical information about databases. They frequently accept deterioration in performance to avoid under-

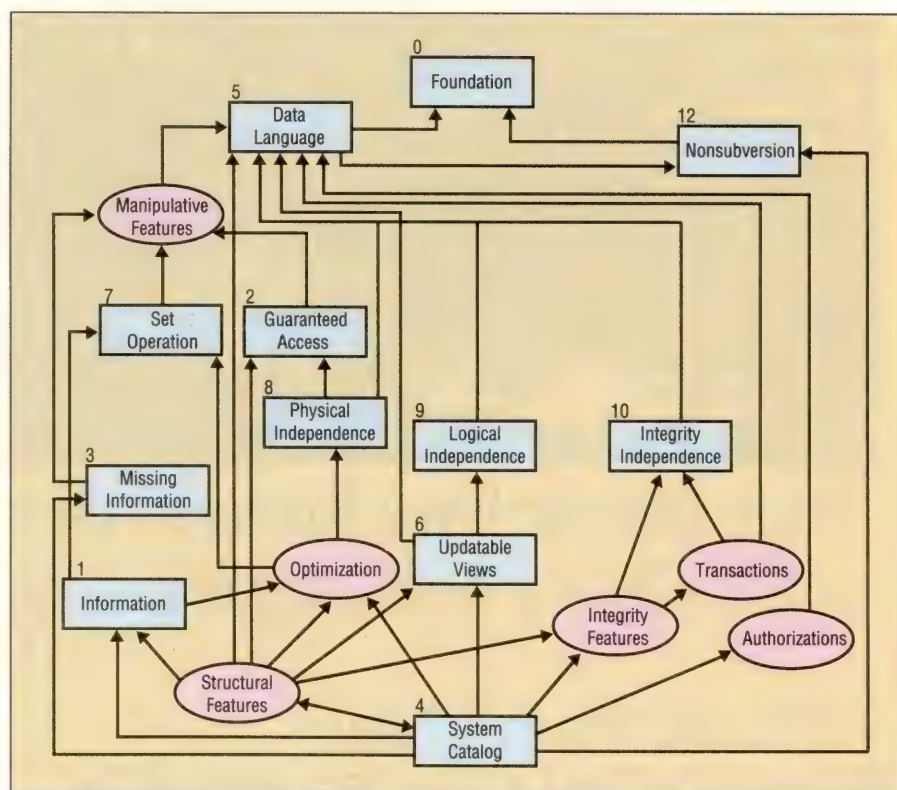


Figure 1.

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UNIX (HP-UX) VERSION (SAME USER INTERFACE)	03/90	N/A	N/A
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HI-COMP America, Inc. is the U.S. sister company of HI-COMP GmbH, a software house based in Hamburg, Germany. The company's two foremost products are DBTUNE, a database management package and HIBACK, a high speed, high compression backup facility. HI-COMP has advertised in HP Professional every month since February of 1988.

HI-COMP had three reasons to advertise in HP Professional.

Rainer Barthel, President, lists the three reasons HI-COMP America, Inc. started advertising in HP Professional. "My first consideration was HP Professional's large circulation base. Second, HP Professional subscribers are buyers — an important group of people to reach. Third, the advertising services that HP Professional offers are beyond comparison with those provided by other publications. Combined, these benefits offer the best opportunities to increase sales."

What convinced you to continue advertising in HP Professional?

"Results. We advertise in order to sell more products. Our ads in HP Professional generate a large number of leads."

Quantity and Quality

Barthel says that HI-COMP America's ads in HP Professional generate more leads than their ads anywhere else. But more importantly, "The quality of each lead is unrivaled. Our salespeople go into sales calls confident that the person they're about to meet is an interested prospect. The lead from HP Professional helps pave the way to a sale."

What is your overall impression of HP Professional as a marketing tool?

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taking such difficult, time-consuming efforts.

Also, with database technology constantly evolving, DBMS vendors need to enhance existing products with improved or new storage structures and access mechanisms. If database operations are dependent on such details, users won't be able to benefit from the enhancements transparently.

Note: Most hardware and operating systems have different internal ways of storing and accessing data. Dependence on physical details would, therefore, also make DBMSs and applications *platform dependent*, and thus not smoothly portable or distributable across computers.

Rule 8 requires the separation of the logical and physical aspects of databases by the DBMS and the insulation of queries and user applications from the physical aspect.

- *Interactive operations*
- *application programs*

should not have to be modified whenever changes in internal

- *storage structures*
- *access methods*

are made to the database.

How users see the data in logical tables and views shouldn't be dependent on how data is physically stored and accessed on disk. What Rule 8 requires, in fact, is that the DBMS should transparently handle the physical level, while users interact with the logical level only.

Rule 2 implicitly requires compliance with Rule 8, because it wouldn't be possible to guarantee logical access for data operations if physical details weren't kept separate and transparent to users (see *Figure 1*).

Set Operation

Table operations are defined by the relational algebra. Relations are sets and, therefore, R-tables can be mathematically manipulated in whole as sets of rows. Database operations retrieve, add, change and delete data in tables. The DBMS must directly support all possible operations at the set level to yield relational power and simplicity.

Traditional products operate at the record, not set level. Even some rela-

tional DBMSs were originally designed to support only retrieval at the set level, but not updates that still were done one record at a time, forcing users into iterative loops. Rule 7 ensures that the DBMS manipulates tables as sets of rows for *all* database operations.

The capability of
- operating on *whole tables*
applies not only to

- *retrieval*
but also to
- *insertion*
- *modification*
- *deletion*
of data.

Optimization And Performance

Rule 8 mandates separation of physical details from the user's logical database view and Rule 7 requires operations to be set oriented. The DBMS, therefore, must have the intelligence to physically store and access the data efficiently and transparently to users and applications. DBMS designers aren't restricted on how to achieve this. They have complete freedom of implementation as long as they don't expose users to physical details. Physically independent set operation is optimized by the DBMS.

Traditional DBMSs force users to know database physical and statistical details (e.g., the number of rows in each table, the size of the data in columns, whether the values in a column are unique and, if not, what their distribution is, and what types of indexes and other access mechanisms are available, the physical location/order of file records on disk, etc.) to make operations efficient. This would be difficult even if databases were stable, but because they're dynamic, it's practically impossible.

Relational DBMSs, on the other hand, must operate efficiently on their own. They must have built-in intelligence for this purpose. It is designed into a special module called an optimizer. The system collects information about databases and makes it available to the optimizer, which uses it to decide how to perform operations in the most efficient way.

Relational operations are well defined

mathematically and involve whole tables. Moreover, each is basically a sequence of one or more two-table operations that can be nested in more than one way to yield the same result. Consequently, the optimizer can discern up front what the overall intent of the operation is, consider the various processing alternatives in terms of their disk I/O and processing load and, based on information about the database, decide which is optimal.

With complex, dynamic databases, these decisions are complicated and the optimizer, invisible to the user, is a crucial component for a relational DBMS. Its degree of intelligence and the type and quality of information it has can make or break a product, and good optimizers are difficult and expensive to build.

However difficult it is to develop a good optimizer, leaving all its tasks to each and every user/application is a hopeless proposition. If optimization by users isn't arbitrary, then at least some of the important decisions can be instilled in software. In fact, it's unlikely that users will keep track of dynamic databases as well as the system can.

In any case, even imperfect optimizers release users from such an impossible burden. Even some degree of lesser *machine* performance is preferable to the *human* performance problems incurred otherwise.

Figure 1 shows that interaction with the database through a comprehensive data language as required by Rule 5 mandates DBMS compliance with Rules 7 and 2. Rule 2, in turn, requires DBMS compliance with Rule 8, which implies optimization. All this necessitates compliance with Rule 1 as well as support of structural and description relational features.

The database must be stored by the system somewhere for the optimizer. The system catalog is a logical place and, therefore, its existence is necessary, at least, for optimization. The catalog must consist, for the sake of Rule 1, of R-tables. —*Fabian Pascal is president of micro-paSQL, Washington, DC.*

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NETWORKING

Gordon McLachlan

When Standards, Money And Foreigners Get In The Way

Who's Denying Us Networks?

In light of glasnost, and the sudden collapse of communism, we need to find a new threat to Western Civilization. Lest we all become eco-guérillas for want of a better target, I present my "Conspiracy Theory of Network Standards."

According to the conspiracy theory of history, civilization has been subtly manipulated by the cognoscenti, those secret organizations and groups of the rich and powerful who know what's going on, and profit because of it.

Well, things are strange enough in the standards world that it just can't be stupidity. There's got to be something going on. Let's try to figure it out.

In order to have a conspiracy, we need some conspirators. The more sinister the better. How about foreigners? Any good international conspiracy needs foreigners. Otherwise, it's just a domestic conspiracy, and those aren't nearly as much fun.

What's the numero uno standards set that everybody is all excited about? The International Standards Organization's Open Systems Interconnection (ISO/OSI) model, right? And who thought up that baby? A bunch of foreigners, that's who. Why are they coming up with network standards, for us, the good old U.S. of A?

In Europe, the governments own the telephone systems. And these governments are part and parcel of the post office. If you want a data communications line overseas, you have to do it through an international record carrier, which has the approval of the local Postal, Telephone and Telegraph (PTT) authority to run a network concession in that country.

Sitting right next to each other the way they do, the Europeans have had ample opportunity to get together and conspire. This has culminated in the European Economic Community's plan for economic unification by 1992. Do you doubt for a moment the mischief they are capable of in network standards organizations?

The two chief international standards groups are the International Telephone and Telegraph Consultative Committee (CCITT) and the International Standards Organization (ISO).

CCITT has a U.N. treaty, and is comprised of the government PTTs and the international record carriers. CCITT also gets marching orders from the European Computer Manufacturers' Association (ECMA). In one guise or another, the CCITT has been around since the introduction of the Baudot code for telegraph in the mid-1800s.

Notice how that happened. The U.S. invented the telegraph, and then some Frenchmen set the code standard just because we let them put the other end of the trans-Atlantic cable in Paris. We

should have put it in London.

The International Standards Organization originally was supposed to set standards for bolt sizes so that you could use a German wrench (or a British hammer) on your Fiat. Sneakily, they got involved in data communications standards, too.

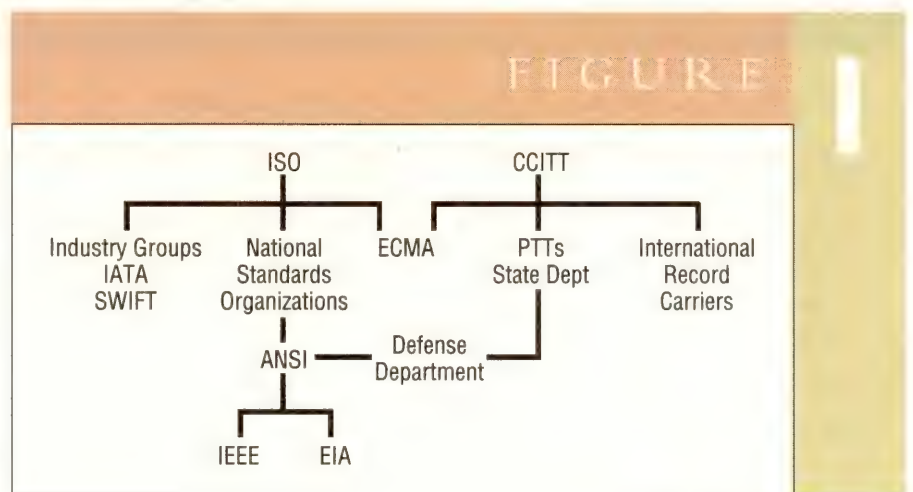
ISO consists of representatives of each participating government's "official" national standards group.

Our own American National Standards Institute (ANSI) is affiliated with ISO, as are other national standards bodies such as the French Association for Normalization (AFNOR), and the German Institute for Normalization (DIN).

How About Big Business?

AT&T and other carriers sit on the CCITT committees right along with the government Postal, Telephone and Telegraph authorities of various countries.

ISO and the CCITT also get marching orders from the ECMA. This is a group of about 20 European computer manufacturers, whose primary goal is to avoid getting their butts kicked by IBM and other American computer companies.



The Standards Conspiracy.

Other special-interest groups, such as the International Air Transport Association (IATA) and the Society for Worldwide Interbank Funds Transfer (SWIFT) are heavily involved with ISO.

Suspiciously enough, most of these outfits are headquartered in Switzerland, along with Antonio Noriega's money. Pretty tricky.

The most notable American contribution to ISO/OSI has been the Manufacturing Automation Protocol (MAP), which was promulgated by General Motors. Unfortunately, GM backed out of the MAP standards effort as soon as they got robots painting each other. My theory is that EDS wants to put in IBM mainframes, but that's another conspiracy we will have to deal with later.

ANSI gets its direction, if you want to call it that, from almost 200 domestic groups, including the Institute of Electronics and Electrical Engineers (responsible for such technological marvels as the RS-232 "standard") and the 802.3 Ethernet "standard" — and the Electronics Industries Association (EIA), a group of vendors of computer and communications equipment. ANSI also gets input from the Department of Defense and the State Department (hmmm).

The fellows in the DoD are just the people you want to talk to about standards, right? These are the guys with four-page specifications for military-issue Worcestershire sauce and who buy \$650 toilet seats. I want them to spec my network?

The DoD has something called TCP/IP, the Transmission Control Protocol and the Internet Protocol. Tired of waiting for foreigners to do an American's job, they applied good old Yankee ingenuity and Pentagon bucks to the problem and came up with a network that works. Sort of.

TCP/IP looks nothing like ISO, but what the heck. It isn't bad for government work. It allows crude terminal emulation, cruder data transfer and real crude electronic mail, but like I said, it works. *Figure 1* shows the whole tangled web.

Now that we have the bad guys lined up, we have to figure out who's doing

what, and why they're doing it.

What is the insidious plot that's denying us networks? What are the trade groups doing? Very little. SWIFT and IATA have theirs. They don't care if you get yours, but they aren't actively opposed.

The computer industry associations are less benign. They have their turf to worry about. Standards are a great idea for the customer. They are not so great

Proprietary starts with a "P," and "P" stands for profit. Proprietary networks give vendors what HP likes to call "account control;" standard networks don't.

for the vendors.

The Europeans are supposed to be one big happy economic family in two years, and they have a computer industry to protect. I'd bet you can't name four European computer companies, but Europe has a bunch of them.

The American companies are no better. Proprietary starts with a "P," and "P" stands for profit. Proprietary networks give vendors what HP likes to call "account control;" standard networks don't.

It's not an accident that IBM hasn't been participating with ISO until rather recently. SNA wasn't good enough for a standard, even if IBM really did know what it was (there is some doubt about that).

It was obvious from the beginning that OSI was going to be something completely different. IBM does not have the same death grip on the European market that they do over here, and if the EEC has its way, they never will.

On top of this, the Defense Department and the spooks in the State Department still have to make sure the Evil Empire doesn't get hold of any technology that is too slick.

The Europeans, on the other hand, want to sell everything they can. Needless to say, that means a lot of U.S. technology won't make the hit parade, because exporting it is a security risk.

We wouldn't want those Vectras in a Russki submarine, would we? A couple of games of 688 Attack Sub, and they'd have our defensive strategy on the line.

There are many people involved in standards-setting. Too bad they don't want standards. You'll notice that the only "standards" that have ever stuck are those with big bucks behind them.

The gnomes of Zurich with their

money laundering network, the airlines, GM and the Department of Defense all have one thing in common: They can tell their vendors to get standard or forget about ever selling them any more computer equipment, and they have the clout to make it stick.

The CCITT standards stick because the record carriers don't get the business unless their stuff talks on the network. With a unified European economy, you can bet that the CCITT X committee e-mail standards — such as X.400 — will take off.

So that's the whole game? Money? How mundane. At least a plan for global domination through telecommunications would have been good press. Greed is too ordinary a motive. It is almost admirable.

So, if you've got the bucks, you get the network. What's new? The rest of us get the scraps. Do you want standards? Too bad you don't need an airline reservations system. Maybe you can buy MAP. HP has that. It won't do much for your spreadsheet data or e-mail, but maybe you can get your PC to paint your desk.

So, I guess I was wrong. There's no conspiracy. Never mind. —*Gordon McLachlan is an independent consultant based in Canton, MI.*

Would you like to continue to see articles on this topic?
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Continued from page 24

or private facilities. It can be used with any DS3 network application, such as broadcast-quality video, wide-area networks and multiplexed voice/data networks.

Contact Cylink, 110 S. Wolfe Rd., Sunnyvale, CA 94086; (408) 735-5800.

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Infocentre Releases SpeedNet 2.0

Infocentre has released SpeedNet version 2.0, a communications program to allow the database on a PC to communicate with databases on HP minicomputers.

SpeedNet works with Speedbase, Infocentre's database management system for the PC, and communicates with image databases residing on HP 3000 minicomputers. Datasets in the database making use of SpeedNet can reside on either or both computers and communications between the computers is transparent to the user.

SpeedNet operates over serial lines connected directly to the HP 3000, or across HP's Officeshare LAN. It supports full error correction and automatically compresses and decompresses data transmitted between the two computers.

Contact Infocentre, 7420 Airport Rd., Suite 201, Mississauga, Ontario, Canada L4T 4E5; (416) 678-1641.

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ASK Offers New Service Products

ASK Computer Systems has announced three new products and major enhancements to the Warranty-Plus Program.

Under a new program called Extended Warranty Plus, ASK now provides 24-hour hotline service to its North American MANMAN customers. This is achieved by linking three of ASK's worldwide response centers in Los Altos, CA; Burlington, MA and Great Britain in a seamless communications network accessed by ASK's 800 telephone number. ASK is offering this service to Warranty-Plus customers on a no-charge basis for the first 60 days.

Other new services include an electronic bulletin board with customer information; streamlined, easy-to-read documentation and documentation on diskette; and upgraded software release management systems. ASK Computer Systems products run on HP 3000s, DEC VAXs and IBM AS/400 computers. Contact ASK Computer Systems Inc., 2440

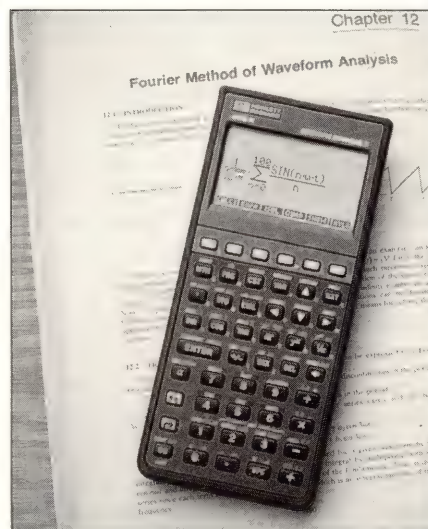
W. El Camino Real, P.O. Box 7640, Mountain View, CA 94039-7640; (415) 969-4442.

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HP Integrates Scientific Calculator And PC

Hewlett-Packard has introduced a scientific calculator designed to capitalize on the dedicated user interface of a calculator while taking advantage of the storage and display capabilities of PCs.

The HP 48SX scientific expandable calculator (U.S. list \$350) offers several features including automatic unit management, serial interface to PCs plus a two-way infrared interface, graphics integrated with calculus functions and an HP EquationWriter application.



HP's 48SX scientific calculator allows engineers to enter equations in the same form as they appear in a textbook.

NONSTOP NETWORK Provides Level 3 Fault Tolerance

Nonstop Networks Limited has released NONSTOP NETWORK, a Level 3 Fault Tolerance DOS Utility that duplicates multiple designated directories (or complete drives) to back up devices anywhere on the network.

This workstation-based product uses under 20K of workstation RAM, doesn't run on the server, supports all popular networks, allows continuous processing when a disc drive or server fails and includes automated recovery and verify routines.

Level 3 Fault Tolerance protects users against disc medium failures, disc subsystem failures,

file server failures, file server to disc subsystem cabling failures and workstation to file server cabling failures, assuming that a good connection still exists between the workstation and the remaining drive.

The five-workstation version costs \$1,290, additional users are \$99 each with a reducing cost after 25 users.

Contact Nonstop Networks Limited, 20 Waterside, New York, NY 10010; (212) 481-8488.

Circle 382 on reader card

FUSYN Automates Data Collection

FUSYN Corp. has announced the Data Engine, a new approach to data collection analysis and testing.

The Data Engine combines data from RS-232/422 devices, GPIB (IEEE-488), digital (TTL level) with relays to support a variety of applications. The Data Engine can perform permanent test or control functions and is appropriate for short-term prototyping applications.

The Data Engine contains its own multilevel help system. A fourth-generation language allows control and analysis of tests for a variety of devices. The Data Engine supports multiple users each their own information area with password access control.

Contact FUSYN Corp., Dept. DE/GN, 6002-D Triangle Dr., Raleigh, NC 27613; (919) 783-7704.

Circle 379 on reader card

INGRES/Windowview Provides User-Friendly Front End

Ingres Corp. has introduced INGRES/Windowview that enables INGRES applications developed for character-based terminals to run unchanged in a workstation environment with full support for a mouse-based, multiwindow interface.

Functionality built into the INGRES/Windowview feature allows workstation users to select fields on an INGRES form using a mouse to scroll rows of data in a table field and to translate the menu line of an INGRES form into a pull-down menu.

The INGRES/Windowview feature is included in the INGRES components of the Santa Cruz Operation's (SCO) Open Desktop product and will be included in future releases of INGRES products designed for X-Window-based workstation environments, including HP, Sun, DEC and others.

NEW PRODUCTS

including HP, Sun, DEC and others.

Contact Ingres Corp., 1080 Marina Village Pkwy., Alameda, CA 94501; (800) 4-INGRES.

Circle 378 on reader card

SED6065 Interfaced In HP-IB

Sedasis has released a new peripheral for HP workstations, the SED6065 magneto-optical disc interfaced in HP-IB that can be erased and rerecorded indefinitely.

The SED6065 supports the CS/80 set of instructions. Consequently, it suits the HP 1000, 3000 and 9000 computers and is recognized by the system as a classic mass memory.

The SED6065 offers a storage capacity of 650 MB per cartridge that's evenly distributed on the two sides of the support (325 MB on each side). The recording support is a removable 5 1/4-inch magneto-optical disc.

Contact Sedasis, 14 Rue de Maupertuis, Z.I. de Kergonan, 29601 Brest Cedex, France: 33 98 41 70 90.

Circle 393 on reader card

AutoSIGHT Develops File-Access Tool

AutoSIGHT Inc. has announced AutoSIGHT Mini, a compact, view-only CAD system file-access tool that enables users to view files and drawings on their desktop PCs.

AutoSIGHT Mini provides shop floor graphics; supports file management procedures; allows viewing of CAD file contents; operates within other applications; works with DWG, DXF, HP-GL and PCX files; allows users to view scanner files and permits the viewing of the previous or next drawing.

AutoSIGHT Mini works with IBM PC, XT, AT, PS/2 and compatible units and requires an MS-DOS 2.0 release or higher. It's priced at \$195.

Contact AutoSIGHT Inc., P.O. Box 362086, Melbourne, FL 32936-2086; (407) 242-5865.

Circle 385 on reader card

Data Physics Offers Signal Analysis Software

Data Physics Corp. has introduced a software link to allow users of HP 5183A Waveform Recorders to process captured data with SIGNALCALC, a signal analysis software system for HP 9000 Series 300 workstations.

The DP105 HP 5183A SIGNALCALC Connection consists of program files that are easily added to the HP 5183A BASIC software

disc. The programs contain illustrations for using SIGNALCALC for FFT analysis including windows to control leakage with graphic output in the form of Bode plots.

Through the linkage provided by DP105, HP 5183A users have access to over 50 DP210 measurement and analysis commands, including FFT, Windowing, Signal Math, Power Spectral Density, Correlation and Display functions.

DP105 is available on a no charge basis for registered owners of Data Physics' DP210 SIGNALCALC. Prospective customers will receive DP105 upon request when ordering SIGNALCALC at its current price of \$2,200. Contact Data Physics Corp., 1210 S. Bascom Ave., Suite 224, San Jose, CA 95128; (408) 977-0800.

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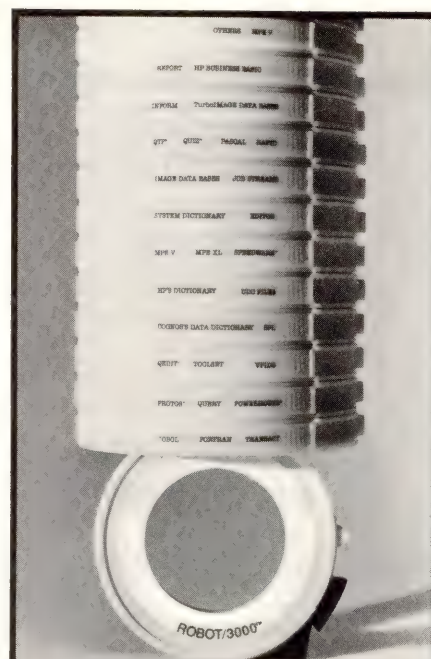
For Your Information

■ Business Computer Software (Bloomfield Mills, MI) has earned Hewlett-Packard's "HP+ Referenced" status for its software solutions and Whole Distribution products. The rating is reserved by HP for its VABs that receive high product ratings from their customers. BCS's software operates on HP 9000 computers in HP-UX, BASIC and Oracle. (313) 338-6880.

■ Eagle Consulting & Development Corp. (Kinnelon, NJ) has been chosen by NORAND Corp. to be a value added reseller. ECD is the developer of Radio Frequency (RF) Express for HP computer systems. (201) 838-5006.

■ The Software Industry Division (SID) of ADAPSO announced the release of "Computer Viruses—Dealing with Electronic Vandalism and Programmed Threats," a 109-page guide to understanding and combating computer viruses. The guide was produced to meet three needs: to help protect against viruses that are increasing in frequency and destructiveness; to deliver facts about computer security and the importance of it; and to mitigate the widespread misunderstanding and rumor concerning viruses. (703) 525-2279.

■ UniForum (Santa Clara, CA) has announced the UniForum Research Award Program. Two awards, each worth \$10,000 per year, will be given annually to deserving graduate students. One award is aimed at a candidate seeking an advanced degree in the technical study of computer sciences. The other targets a candidate seeking an advanced degree in management sciences as they apply to information management. (408) 986-8840.



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[CALENDAR]

[MAY]

22-24: Patricia Seybold's Office Computing Group presents "The Applications Development Environment of the 1990s: Can UNIX Set The Innovation Agenda?" Call (800) 826- 2424.

28-6/1: The 11th Annual Eastern American Hewlett-Packard Users Conference is scheduled for the Bally's Plaza Hotel and Casino, Atlantic City, NJ. Call (215) 875- 5324.

[JUNE]

19-20: MTLRUG is holding its quarterly meeting at the Dorval Airport Hilton, Canada. Call Mich Kabay (514) 931- 8167.

23: The Cincinnati Municipal Users' Group (CINMUG) is holding a meeting at the BB Riverboat in Covington, KY. Call Joseph Speier (513) 351-8888.

24-28: The 27th Design Automation Conference is being held at the Orlando/ Orange County Convention Center in Orlando, FL. For more information call (303) 530-4333.

29-6/1: Interop Inc. is sponsoring two-day Internetworking Tutorials for networking

professionals. Call 1-800- INTEROP for course information and registration.

[JULY]

18-19: MINNRUG (Minnesota Regional User Group) is holding its first conference on "Solutions for the '90s," at the Hotel Sofitel in Mpls, MN. Call (612) 337-9899.

[AUGUST]

20-23: 1990 INTEREX HP Users Conference will be held at the John B. Hynes Veterans Memorial Convention Center, Boston, MA. For more information call (408) 738-4848.

[SEPTEMBER]

9-13: The 1990 Lasers in Graphics (LIG) and Electronic Design in Print (EDP) conferences are scheduled concurrently in Orlando, FL. Call Patrice Dunn, (619) 758-9460.

[OCTOBER]

11-12: NEVCAL'90, a regional user group conference is being held at Caesar's Lake Tahoe Resort Hotel/Casino, Stateline, Nev. For vendor registration call (916) 544- 6474, ext. 281; for paper submission call Glen Gollick, (916) 444-9304.

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